FIVE-YEAR REVIEW

SECOND FIVE-YEAR REVIEW REPORT

for

VERONA WELL FIELD
Battle Creek, Michigan

September 2007

Prepared by:

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Region 5
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Approved by:

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Date:
9/20/07

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Executive Summary

U.S. EPA's Selected Remedy for the Verona Well Field Site includes: two lines of blocking wells to protect the City of Battle Creek water supply from contamination from the three source areas (named Thomas Solvent Raymond Road (TSRR), the Annex, and the Paint Shop); cleanup of soil in the three source areas by soil vapor extraction; and cleanup of groundwater in the three source area and in downgradient areas by pump-and-treat.

The Second Five-Year Review found that the groundwater cleanup is progressing, and that the blocking well system has been effective in providing protection to the City water supply. During the last five years, the Verona Well Field Group implemented measures that go beyond the ROD requirements, including increasing blocking well pumping rates to provide more protection to the City water supply, and air sparging groundwater at the Annex and Paint Shop to speed cleanup of groundwater.

Problems identified include:

- At the TSRR source area, free product in groundwater below an adjacent facility is complicating and increasing the costs for operating the pump-and-treat system;
- At the TSRR source area, additional soil sampling identified that the soil cleanup objectives have not been achieved;
- At the Annex source area, the data evaluation method used screened out future soil sampling for dieldrin and benzo(a)pyrene;
- At the Annex and Paint Shop source areas, it is unclear whether the deed notice binds future owners to existing restrictions; and
- Businesses and property owners located adjacent to source areas or near the groundwater plume have not been notified that vapor intrusion, if it occurs, could cause a risk if the property is used for residential purposes.

The Verona Well Field Site is divided into two operable units. Operable unit 1 is associated with cleaning up source area soil and groundwater at TSRR. Operable unit 2 is associated with remedial actions to protect the City water supply, to cleanup the aquifer, and to cleanup source area soil and groundwater at the Annex and the Paint Shop. The following protectiveness statement applies to both operable units and to the Site as a whole. The selected remedy is considered protective in the short term; however, in order to assure that it is protective in the long-term, follow up actions need to be implemented, including:

- At the TSRR source area, evaluate further treatment options for soil;
- At the Annex source area, adding dieldrin and benzo(a)pyrene to the final soil sampling; changing the selected remedy to adjust the soil clean up objectives; or changing the selected remedy to require permanent usage restrictions;

- At the Annex and Paint Shop source area, evaluating whether the deed notice is effective to bind future owners to property use restrictions, and if necessary proposing a restrictive covenant in order to ensure the remedy's long-term protectiveness; and
- Notifying nearby businesses and property owners of the potential for vapor intrusion.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Verona Well Field		
EPA ID *(from WasteLAN)*: **MID980793806**		
Region: 5	**State:** MI	**City/County:** Battle Creek / Calhoun County
SITE STATUS		
NPL status: X Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction X Operating ☐ Complete		
Multiple OUs?* X YES ☐ NO	**Construction completion date:** 06 / 26 / 1997	
Has site been put into reuse? ☐ YES X NO		
REVIEW STATUS		
Lead agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____		
Author name: Richard Boice		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA	
Review period:** 10 / 05 / 2006 to 08 / 29 / 2007		
Date(s) of site inspection: 04 / 16 / 2007 and 08 / 23 / 2007		
Type of review: X Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) X 2 (second) ☐ 3 (third) ☐ Other (specify) _____		
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐Actual RA Start at OU#____ ☐ Construction Completion X Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 09 / 30 / 2002		
Due date *(five years after triggering action date)*: 09 / 30 / 2007		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd

Issues:

1. At the TSRR source area, free product in groundwater below an adjacent facility is complicating and increasing the costs for operating the pump-and-treat system;
2. At the TSRR source area, additional soil sampling identified that the soil cleanup objectives have not been achieved;
3. At the Annex source area, the data evaluation method used screened out future soil sampling for dieldrin and benzo(a)pyrene;
4. At the Annex and Paint Shop source areas, it is unclear whether the deed notice binds future owners to existing restrictions; and
5. Business and property owners located adjacent to source areas or near the groundwater plume have not been notified that vapor intrusion, if it occurs, could cause a risk if the property is used for residential purposes.

Recommendations and Follow-up Actions:

1. Install and operate EW3R and the Davis Oil free product recovery system, and evaluate other technologies to clean up free product.
2. Evaluate further treatment options for TSRR soil.
3. Add dieldrin and benzo(a)pyrene to the final soil sampling at the Annex; further evaluate soil cleanup criteria; or require permanent usage restrictions.
4. Evaluate whether the deed notice is effective to bind future owners to property use restrictions, and if necessary propose a restrictive covenant in order to ensure the remedy's long-term protectiveness; and;
5. Notify nearby businesses and property owners of the potential for vapor intrusion.

Other Comments:

Date of last Regional review of Human Exposure Indicator (from WasteLAN): 9/29/2006.
Human Exposure Survey Status (from WasteLAN): current human exposure controlled and protective remedy in place.
Date of last Regional review of Groundwater Migration Indicator (from WasteLAN): 6/13/2007
Groundwater Migration Survey Status (from WasteLAN): Contaminated ground water migration under control
Ready for Reuse Determination Status (from WasteLAN): NA

LIST OF ACRONYMS AND ABBREVIATIONS

Annex:	Thomas Solvent Company; s Annex source area, which was leased from Grand Trunk
ARAR:	Applicable or relevant and appropriate requirement under Superfund.
CH_2M-Hill:	CH_2M-Hill, Inc., the U.S. EPA contractor who conducted the RI/FS, constructed the SVE and groundwater pump-and-treat system at TSRR, and operated these systems for a few years.
Cis:	cis-1,2-dichloroethylene
City:	City of Battle Creek
City Consent Decree:	A consent decree between the VWF Group, and the City of Battle Creek that was entered in court on January 26, 2006.
CUO:	Clean-up objective from the 1991 ROD or 2002 ESD
Davis Oil:	Davis Oil Company
1,1-DCA:	1,1-dichloroethane
1,1-DCE:	1,1-dichloroethylene
1,2-DCE:	The total of the cis- and trans- isomers of 1,2-dichloroethylene
ESD:	Explanation of Significant Differences
Federal Consent Decree:	A consent decree between the VWF Group, and the United States that was entered in court on January 26, 2006
Grand Trunk:	Canadian National / Grand Trunk Western Railroad Company
ICS:	Institutional Controls Study, Progressive, May 2007.
IRIS:	U.S. EPA's Integrated Risk Information System. This is available from U.S. EPA's web site.
MCL:	Safe Drinking Water Act Maximum Contaminant Level

MDNR:	The Michigan Department of Natural Resources (predecessor of MDEQ)
MDEQ:	The Michigan Department of Environmental Quality
mdg:	Millions of gallons per day, a measure used for the City of Battle Creek pumping rate.
NBWs:	Northern blocking wells.
O&M:	Operation and Maintenance, typically O&M is also considered to include monitoring
Paint Shop:	Grand Trunk marshalling yard Paint Shop source area
PCBs:	Polychlorinated biphenyls
PCE:	Perchloroethylene (tetrachloroethylene)
PRGs:	Preliminary Remediation Goals developed by U.S. EPA Region 9
Progressive:	Progressive Engineering and Construction, Inc., a technical consultant for the VWF Group
QAPP:	Quality Assurance Project Plan
RBSLs:	Michigan Tier 1 Risk Based Screening Levels
ROD:	Record of Decision
SBWs:	Southern blocking wells
Site:	Verona Well Field site
SSLs:	Soil screening levels for screening for soil contaminant concentrations that may adversely impact groundwater developed by U.S. EPA Region 9
State Michigan Decree:	A consent decree between the VWF Group, and the State of Michigan that was entered in court on February 21, 2006
SVE:	Soil Treatment by Soil Vapor Extraction
SVOCs:	Semivolatile organic compounds

1,1,2,2-TCA	1,1,2,2-tetrachloroethane
TCE:	Trichloroethylene
TDL:	Target Detection Limit
TSRR:	The Thomas Solvent Company, Raymond Road Source Area
ug/kg:	Concentration of a Contaminant in Soil in Micrograms of Contaminant per Kilogram of Soil (equal to parts per billion by weight).
ug/l:	Concentration of a Contaminant in Water in Micrograms of Contaminant Per Liter of Water (equal to parts per billion by weight)
U.S. EPA:	United States Environmental Protection Agency
VC:	Vinyl chloride
VOCs:	Volatile Organic Compounds
VWF:	Verona Well Field
VWF Group:	The Verona Well Field Remedial Design / Remedial Action Group is a group of parties who are performing remedial actions at the Site, including Grand Trunk and a group of generators.
VWFMP	A plan requiring actions and coordination among the VWF Group, the City of Battle Creek, and MDEQ

I. Introduction

This report presents the results of the second five-year review for the Verona Well Field (VWF) site (the Site) located in and near Battle Creek, Michigan. The Site includes three source areas and the aquifer areas impacted by contamination from these source areas, which has threatened the water supply for approximately 55,000 residents, as well as businesses and industries (see Attachment 1). The total area of groundwater contamination has covered over 160 acres, while each of the source areas covers about one acre. This review was initiated in October 2006, and completed on the date it was signed (see signature page). This review was performed by the United States Environmental Protection Agency (U.S. EPA) Region 5 with input from the following parties; the Michigan Department of Environmental Quality (MDEQ) and he VWF Group through its project manager, Progressive Engineering and Construction, Inc. (Progressive).

The purpose of this review is to determine whether or not the remedy remains protective of human health and the environment. The Site remedy includes: protection of the City water supply using two lines of blocking wells; clean-up of soils in the three source areas by soil vapor extraction (SVE); and capture and clean-up of source area groundwater using pump-and-treatment. The two-lines of blocking wells are designed to create two continuous lines of groundwater capture in three aquifers between the three contaminant source areas and the northern part of the VWF, where the City's active production wells are located.

U.S. EPA is preparing this five-year review pursuant to Section 121 of the Comprehensive Environmental Response Compensation and Liability Act, which states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with Section 106, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

U.S. EPA interpreted this requirement further in the National Contingency Plan; 40 CFR Section 300.430(F)(4)(ii), which states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The signature date for the *First Five-Year Review Report* was September 30, 2002, which makes the required completion data for this five-year review no later than September 30, 2007. This report will be placed in the Verona Well Field Administrative Record file located at U.S. EPA's office at 77 W. Jackson Boulevard, Chicago, Illinois, and in the local document repository, which is located at Willard Library, 7 West Van Buren, Battle Creek, Michigan.

II. Site Chronology

Following is a table summarizing major milestones for the Site. A more detailed summary follows the table.

Table 1: Chronological Summary of Major Milestones in Site Cleanup

MILESTONE	DATE
Initial discovery of contamination in City of Battle Creek water supply wells, and some private residential wells.	1981
Site added to U.S. EPA's National Priorities List.	1982
U.S. EPA / MDNR (predecessor of MDEQ) provided bottled water to affected residents	1982 - 1984
U.S. EPA converted City water supply wells to a single line of blocking well lines to protect northern part of the VWF.	1984
MDNR / MDEQ operated the single line blocking well system.	1984 -1996
U.S. EPA signed Record of Decision (ROD) for cleanup of TSRR source area.	1985
U.S. EPA constructed the Thomas Solvent Raymond Road (TSRR) SVE and pump-and-treat systems	1986 - 1988
U.S. EPA / MDEQ operated the TSRR pump and treat system	1987 - present
U.S. EPA operated TSRR SVE system	1988 - 1992
U.S. EPA signed a ROD requiring two lines of blocking wells, SVE at Annex and Paint Shop, pump-and-treat at Annex and Paint Shop, and expansion of TSRR pump-and-treat	1991
U.S. EPA issued unilateral administrative orders to the VWF Group	1992
VWF Group constructed and operated the SVE system at the Annex and Paint Shop	1992 - 1994
VWF Group constructed upgrades to the single blocking well line, a second blocking well line that also functions as the Paint Shop pump and treat system, and a separate pump and treat system for the Annex. U.S. EPA constructed a separate groundwater treatment facility for TSRR.	1996

MILESTONE	DATE
VWF has operated the two blocking well line, Paint Shop, and Annex pump-and-treat system.	1996 - present
U.S. EPA completed the *First Five-year review Report.*	2002
U.S. EPA issued an Explanation of Significant Differences (ESD).	2003
VWF Group constructed: expansions of pump-and-treat systems to improve groundwater capture at the Annex and Paint Shop; and expansion of the blocking well system (under an agreement with MDEQ and the City of Battle Creek).	2003 - 2004
VWF constructed and has operated air sparging systems at the Annex and Paint Shop.	2004 - present
Separate Consent Decrees between the VWF Group and the United States, the State of Michigan and the City of Battle Creek were entered in court.	2006

Following is a more detailed summary of events since 2002. Further details on the period before 2002 were included in the *First Five-Year Review Report.*

1999 - present: Under MDEQ oversight, Davis Oil has been investigating the extent of free product and related groundwater contamination on its property, and removing free product by hand bailing when possible.

2002: U.S. EPA performed the first five-year review. U.S. EPA determined that the remedies for the Site were protective in the short-term, but that certain additional actions needed to be taken to assure that the remedy will be protective in the long-term (see Section V of this report). On May 31, 2002, the long-term response action period expired for the TSRR pump-and-treat system, and, as a result, MDEQ became fully responsible for operation and maintenance (O&M) of this system. The VWF Group and MDEQ performed sampling to characterize background groundwater for metals, and source area groundwater for certain semi-volatile organic compounds (SVOCs) and metals. U.S. EPA and MDEQ performed hot spot sampling of source area soils for SVOCs, metals, pesticides, and polychlorinated biphenyls (PCBs).

2003: U.S. EPA signed an Explanation of Significant Differences (ESD), which clarified monitoring requirements, updated the groundwater and soil cleanup objectives, eliminated the requirement to pump and treat TSRR's near down-gradient plume, and addressed concern about the potential for leakage in the Annex pipeline.

The VWF Group obtained U.S. EPA and MDEQ approval to discharge water from the NBWs to the Battle Creek River without treatment. The VWF Group completed the following construction:

- enhanced system bypass piping for the following purposes: to discharge flow from the NBWs to the Battle Creek River without treatment; to eliminate the need for wet-well pumps (which were having maintenance problems and were the source of many shut-downs); and to facilitate expansion of the system to handle flow rates necessary to protect the City water supply in case of future City water production up to 30 mgd;
- piping for a quick disconnect for two NBWs to enable easy connection of aqueous phase carbon treatment if necessary;
- two new extraction wells at the Annex to improve capture of shallow groundwater;
- eight new piezometers at the Annex to improve hydraulic monitoring;
- upgraded well pumps to improve control and provide the capacity for increased flow.

2004: The VWF Group completed the following construction:

- blocking well BW9 to improve capture of contaminated groundwater from the Paint Shop;
- five new piezometers to help monitor the hydraulic effectiveness of the southern blocking wells (SBWs);
- upgraded electrical equipment;
- upgraded and higher capacity well pumps;
- a new telemetry/alarm system;
- piping for a quick disconnect for three SBWs to enable easy connection of aqueous phase carbon treatment, if necessary.

In an action not required in the ROD, the VWF Group installed and initiated operation of an air sparge system at the Annex to accelerate VOC removal from groundwater in the highly contaminated source area.

2005 - present: Grand Trunk conducted pilot testing and initiated operation of a limited air sparge system at the Paint Shop. The VWF Group expanded the Annex air sparging system. These air sparging systems are still in operation. In May 2005, MDEQ conducted limited additional soil boring sampling for VOCs at TSRR.

2006: The following three consent decrees were entered in court: one between the VWF Group and the federal government (Federal Consent Decree); one between the VWF Group and the State of Michigan (State Consent Decree); and one between the VWF Group and the City of Battle Creek (City Consent Decree). The Federal Consent Decree replaced the two unilateral administrative orders as the operable enforcement document between U.S. EPA and the VWF Group. The Federal Consent Decree was entered on January 26, 2006, and, among other provisions, requires continued clean up of the Site in accordance with the requirements in the 1991 ROD as updated by the 2003 ESD and approved project plans, and imposition of institutional controls as

needed. The State Consent Decree was entered on February 21, 2006, and the City Consent Decree on January 26, 2006. Among other provisions the State and City Consent Decrees require that the VWF Group operate the blocking well system to provide protection to the VWF at City water pumping rates up to 30 mgd.

2007: After gaining approval from U.S. EPA and MDEQ, the VWF Group initiated direct discharge of the SBW and Annex flow without treatment.

III. Background

Physical Characteristics: The Site is located in the northeast corner of the City of Battle Creek, Calhoun County, Michigan. The Site includes three source areas (TSRR, Annex, and Paint Shop) and the aquifer areas impacted by contamination from these source areas. The total area of groundwater contamination has covered over 160 acres, but the area of groundwater contamination has been reduced to about 100 acres. Each of the source areas covers only about one acre (see Attachment 2).

The topography is relatively flat (see Attachment 3). The Site is located in the alluvial valley of the Battle Creek River, which courses through the well field. Three aquifers are present at the Site, but they are not separated by confining units: an unconsolidated aquifer consisting of poorly graded glaciofluvial sand deposits; an upper Marshall sandstone aquifer and a lower Marshall sandstone aquifer. The Marshall sandstone aquifers are fractured.

Land and Resource Use: The Site area includes property used for industrial, commercial, and residential purposes. Property owned by Canadian National / Grand Trunk Western Railroad (Grand Trunk) is used primarily for railway and railroad maintenance. Property owned by the City of Battle Creek, which is down gradient from the source areas, is used for water supply production and treatment. Property owned by Davis Oil, which is across Raymond Road from TSRR is used for a gas station and convenience store. The Battle Creek River, residential areas, and an old landfill are also in close proximity to the Site (see Attachments 1 and 2).

History of Contamination: In 1981-1982, ten of the thirty VWF City water production wells, as well as 80 private residential wells were found to be contaminated by a number of volatile organic compounds (VOCs) including benzene, dichloroethanes, dichloroethylenes, methylene chloride, trichloroethylene (TCE), perchloroethylene (PCE or tetrachloroethylene), and vinyl chloride (VC). Up to 356 ug/l of total VOCs were detected in some City production wells, and nearly 1000 ug/l in some residential wells.

Three significant source areas were identified during investigations conducted in the early 1980s. TSRR and the Annex source areas resulted from operations of the Thomas Solvent Company. The Thomas Solvent Company purchased, stored, containerized, blended, transported, and sold virgin solvents, and transported, stored

and arranged for disposal of spent solvents. Thomas Solvent Company handled chlorinated and non-chlorinated solvents, as well as diesel fuel. The Paint Shop source area resulted from painting and maintenance operations of Grand Trunk at its car repair/paint shop and car department building. Solvents and paint thinners were used for cleaning and degreasing.

TSRR had the most highly contaminated soil and groundwater. TSRR operations included storage in and transfer operations from 21 underground storage tanks ranging in capacity from 4,000 to 15,000 gallons. Contamination of the soil and groundwater resulted from leaks in the underground storage tanks, leaking drums, and spills. Direct dumping onto the ground during drum and tank cleaning was also reported. Leak tests conducted in 1986, showed that 9 of the 21 storage tanks were leaking. At the start of the TSRR pump-and-treat system, total VOCs in groundwater were more than 100,000 ug/l, and recoverable amounts of floating free product were present. The vadose-zone soil over much of the Site was also highly contaminated with VOCs. Primary contaminants at TSRR were PCE, TCE, 1,1,1-trichloroethane, methylene chloride, acetone, methylethylketone, methylisobutylketone, toluene, ethylbenzene, and xylenes. The cleanup of free product and resulting groundwater contamination from Davis Oil, has overlapped cleanup of TSRR groundwater. Davis Oil's free product and resulting groundwater contamination underlies the Davis Oil property, and the TSRR groundwater plume underlies Davis Oil property. Entry of Davis Oil's free product into the TSRR pumping wells has been a major concern for the TSRR groundwater cleanup since 2004 when free product was detected in one of the TSRR pumping wells.

Annex operations included storage of solvent wastes in drums (prior to shipment to off-site recycling or disposal facilities), a loading dock for unloading of railway tank cars containing solvents, and two underground storage tanks for storage of virgin solvents. Contamination of the soil and groundwater resulted from leaking drums and surface spills. Direct dumping onto the ground during drum and tank cleaning was also reported. In 1989, groundwater at the Annex had total VOC levels as high as 49,800 ug/l, but no floating free product was detected. The primary groundwater contaminants were vinyl chloride (VC), 1,2-dichloroethylene (1,2-DCE), TCE, PCE, toluene, ethylbenzene, and xylenes. Soil was primarily contaminated with PCE and TCE.

Paint Shop operations included a car-repair shop and car department building. Contamination resulted from disposal of the waste thinner and solvents by dumping them onto the ground or into a drum pit consisting of a 55-gallon barrel half buried in the ground with holes cut in the bottom and side to allow the drainage of solvent. In 1989, up to 64,510 ug/l of total VOCs were detected in groundwater. The primary contaminants were 1,2-DCE, 1,1,1-trichloroethane, PCE, 1,1,2,2-tetrachloroethane (1,1,2,2-TCA), ethylbenzene and xylenes. Soil was primarily contaminated with PCE, with a maximum detection of 35,000 ug/kg.

Initial Response: From 1982 – 1984, U.S. EPA and MDNR provided bottled water and portable showers to the residents with contaminated private wells. In July 1982, the Site was added to the National Priorities List. The City of Battle Creek adjusted its pumping distribution, discharged water from some production wells to the Battle Creek River, and blended water from different wells to maintain an acceptable water supply. However, sampling showed that the VOC contamination was migrating further into the VWF, and, by February 1984, contamination was found to have spread to 27 of the 30 production wells. Residences and businesses with contaminated wells were connected to the City of Battle Creek water supply.

In 1984, U.S. EPA completed an evaluation of alternatives for protection of the City water supply, and approved, designed, constructed, and initiated operation of a single line blocking well system that was to utilize a line of six to twelve City water production wells to prevent VOC contamination from migrating into the northern part of the Verona Well Field. In addition, U.S. EPA funded installation of three new City water production wells to replace lost City water production capacity. At the same time, the City of Battle Creek restricted usage of a number of the production wells closest to the blocking wells. The single blocking well system was successful, and by the end of 1984, eight of the ten production wells located north of the blocking well line were uncontaminated, and the other two showed only sporadic detections of 1 ug/l of various VOCs. From 1984-December 1996, MDNR/MDEQ operated the single line blocking well system.

Basis for Taking Action: Contamination from the Site threatened the water supply for approximately 55,000 residents, as well as businesses and industries. Contamination from all three of these source areas would normally migrate into the City production wells in the Verona Well Field, but is now being captured by the southern and NBWs. At all three source areas VOC contamination was concentrated in the vadose zone and the upper aquifer. The upper aquifer consists of the sand & gravel aquifer at TSRR and the Annex, and the upper sandstone at the Paint Shop. Down-gradient from the TSRR and the Annex, VOC contamination has been most highly concentrated in the upper sandstone aquifer, with lower concentrations detected in the lower sandstone aquifer. Down-gradient from the Paint Shop, the VOC contamination appears to remain in the shallow groundwater, which becomes the sand and gravel aquifer down-gradient of the Paint Shop due to a dip in the bedrock surface. In the 1991 ROD, U.S. EPA concluded that the consumption of groundwater from the source areas and down gradient from the source areas presented an unacceptable risk. See contaminant levels listed in 1981 - 1982 in Section II, and under History of Contamination in this Section.

IV. Remedial Actions

A. Remedy Selection

U.S. EPA's selected remedy includes: two lines of blocking wells to protect VWF production wells from contamination from the three source areas (see Attachment 4);

cleanup of contaminated soil in the three source areas by SVE; and cleanup of contarninated groundwater in the three source areas by pump and treat. For internal tracking purposes, U.S. EPA has divided the Site into two operable units. Operable unit 1 is to track remedial actions to cleanup source area soil and groundwater at TSRR. Operable unit 2 is to track remedial actions to protect the City water supply, to cleanup the aquifer, and to cleanup source area soil and groundwater at the Annex and the Paint Shop. The applicable decision documents for operable unit 1 include: the 1985 OU ROD as revised by the 1991 ROD and the 2003 ESD. The applicable decision documents for operable unit 2 include: the 1984 interim remedial measure ROD; the 1991 ROD; and the 2003 ESD.

Requirements of the State Consent Decree, and City Consent Decree are also inserted when they exceed ROD / ESD requirements. In addition, requirements for cleanup of the adjacent Davis Oil property under the Leaking Underground Storage Tank program are listed. For a summary of the requirements of the Unilateral Administrative Orders, which have been superseded by the recent Federal Consent Decree, see the *First Five-Year Review Report.*

1. Protection of the City of Battle Creek Water Supply, and Operation of the Northern and Southern Blocking Well Lines:

1984 Initial Remedial Measures ROD: The 1984, the Initial Remedial Measure ROD, provided for conversion of a number of City production wells into a single line blocking well system to protect production wells in the northern portion of the VWF, and installation of new City wells to restore six million gallons per day of the City water production capacity. These measures were intended to stabilize conditions at the Verona Well Field until a final remedy is selected and implemented.

1991 Final ROD: The 1991 ROD required construction and operation of a two-line blocking well line system to continue to limit groundwater contamination at the Verona Well Field production wells to levels that do not pose a health hazard (p. 38 of ROD Summary). The ROD did not propose to completely prevent breakthrough of contaminants into the VWF. The evaluation of alternatives used for the ROD anticipated that the two-line blocking well system would be designed to prevent breakthrough of contamination at a City water pumping rate of 80% of the daily maximum pumping rate. The ROD also stated that: "it is EPA's policy not to provide for any future growth when designing remedial actions for Superfund sites"; and "any increase in pumping, or other actions, in the well field by the City that results in failure of the blocking wells to protect the well field will be the responsibility of the City" (see p. 12 of the Responsiveness Summary for the 1991 ROD).[1]

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1 MDEQ did not concur with the 2003 ESD partially because the ESD did not require protection to the City of Battle Creek water supply in case of future increased City water production.

1994 U.S. EPA Approved Design: Required the two-line blocking well system constructed in 1996 to fully capture the contaminant plumes from the three source areas at a City water production rate of 12.4 mgd (80% of the daily maximum City water production rate in 1989) based on modeling conducted by Geraghty & Miller, Inc., a consultant working for the VWF Group.

2003 and 2004 U.S. EPA Approved Design: Required the two-line blocking well system to fully capture the contaminant plumes from the three source areas at a City water production rate of 24.2 mgd.

2006 Federal Consent Decree: In addition to requiring completion of the remedial actions in accordance with the ROD, the ESD, and approved project plans, the Statement of Work to the Consent Decree requires that the VWF Group submit and implement a well abandonment plan.

2006 City and State Consent Decrees: The Consent Decrees include a number of requirements that go beyond ROD requirements, including:

- the design goal of the northern and SBW lines must be to capture all contamination migrating from the TSRR, Annex, and Paint Shop source areas;
- achievement of CUOs at the points of operational compliance for the NBWs (and at points of operational compliance for the SBWs after the NBWs are shut-down);
- maintenance of non-detection of the contaminants of concern in the City water intake;
- design, construction and operation of the enhancements to the blocking well system to provide protection to the prevailing City water production during each and every month up to 30 mgd plus a reasonable margin of safety (the protection to 24 mgd City water production was the second phase of this upgrade);
- cooperation among the VWF Group, the City and MDEQ in developing a Verona Well Field Management Plan, which should provide for coordination of operation of the City production wells with the blocking well system.

2. Source Area Groundwater Capture:

1985 TSRR ROD: The 1985 ROD provided for capture of the TSRR plume in the vicinity of the Site. The vicinity of the Site was defined as the area outlined by the 100,000 ug/l VOC contour, as shown on Figure 9 of the 1985 TSRR ROD.

1986 U.S. EPA Approved Design: The TSRR design provided for construction of a pump and treat system with nine pumping wells with a combined pumping rate of 400 gpm.

1991 Final ROD: The 1991 ROD provided for capture of the TSRR down-gradient plume, which generally included the livestock yard area, including the high VOC contamination at monitoring well CH139S. The 1991 ROD also provided for collection and treatment of groundwater at the Annex and Paint Shop source areas.

1994 U.S. EPA Approved Design: For the Annex, the *RD/RA Design Report* (Geraghty & Miller, September 26, 1994) provided for construction of two extraction wells (GMA-1D and GMA-2D) screened in the upper sandstone aquifer with a combined extraction rate of 90 gpm. However, the Report provided that if startup data indicated that the Annex upper sandstone extraction wells (GMA-1D and GMA-2D) were not influencing the sand and gravel aquifer, then shallow pumping wells (GMA-1S and GMA-2S) may be installed. For the Paint Shop, the *RD/RA Design Report* provided that a separate groundwater extraction system would not be installed. Instead, the northeastern-most SBWs would provide capture and clean-up of the source area groundwater.

2003 ESD: The 2003 ESD eliminated the requirement for the TSRR pump and treat system to capture the TSRR down-gradient plume as defined in the 1991 ROD.

2003 U.S. EPA Approved Design: Required addition of two shallow groundwater pumping wells at the Annex, and addition of one shallow groundwater pumping well northeast of the SBWs (BW9) to contain groundwater from the Paint Shop.

2006 State Consent Decree: Paragraph 6.1(d) requires that the Annex pump and treat system prevent migration of groundwater exceeding the CUOs from the Annex source area (which is specifically defined in the State Consent Decree), and that contaminated groundwater exceeding the CUOs from the Paint Shop be contained at the SBW line. Paragraph 23.1(b) commits MDEQ to operation of the TSRR pump-and-treat system to prevent migration of contaminants of concern exceeding CUOs from the TSRR source area, and to ensure that operational compliance criteria are met in the points of operational compliance. All of the source area groundwater pump-and-treat systems must achieve operational compliance criteria at the points of operational compliance. The *Contingency Plan* identifies operational compliance criteria as: non-increasing or decreasing VOC concentrations.

3. Groundwater Clean-up:

1991 Final ROD, as updated by the 2003 ESD: Site-specific CUOs for prevalent VOCs in groundwater to be achieved by groundwater pump-and-treat were listed in Table 16 of the 1991 ROD. The groundwater CUO for each VOC was the lowest concentration among the following clean-up goals:

- a cancer risk goal equal to the concentration estimated to produce an incremental lifetime cancer risk of $1X\ 10^{-6}$ due to ingestion of drinking water in the residential scenario (called the Cancer Risk Goal in Table 16);

- a non-carcinogen risk goal equal to the concentration estimated to produce an exposure rate equal to the reference dose for health effects other than cancer due to ingestion of drinking water in the residential scenario (called the Non-Carcinogen Risk-Ratio Goal);
- the Safe Drinking Water Act, Maximum Contaminant Levels (MCLs);
- the Michigan Act 307, Type B groundwater clean-up criteria.

However, if any of the clean-up goals were less than the laboratory target detection limit (TDL), then the TDL became the CUO. The groundwater CUOs apply to the entire aquifer. Using similar procedures but updated standards, toxicological data, and exposure assumptions, the CUOs were updated in the 2003 ESD (see Table 19).[2]

2006 State Consent Decree: Requires the VWF Group to conduct source area enhancements at the Annex, including treatment of the highest groundwater contamination at the Annex by air sparging.

4. Groundwater Sampling and Monitoring:

Remedial Investigation: As explained in the *First Five-Year Review Report*, the remedial investigation included soil and groundwater sampling. All samples were analyzed for VOCs, and the number of samples analyzed for SVOCs, pesticides, PCBs and metals was limited.

Design Development Sampling: In 1993, the VWF Group measured groundwater elevations from 120 wells and sampled over 70 wells for design purposes. This included 20 groundwater samples near the Annex, which were analyzed for VOCs.

1991 ROD as updated by 2003 ESD: Testing for contaminants other than VOCs had been limited. For that reason, after a comprehensive review of available data, limited additional soil and groundwater sampling for certain SVOCs and metals was conducted in 2002. Using this data, U.S. EPA decided that only the list of VOCs plus arsenic (in Annex groundwater only) needed to be included in the long-term groundwater monitoring, and soil sampling (see attached ESD Table 1). A list of contaminants of potential concern was also included in the ESD (1,1,2,2-TCA and dieldrin at the Annex source area; and aluminum, sodium, and iron at the Paint Shop source area).

The *2006 Groundwater Monitoring Plan* attached to Federal and State Consent Decrees: By 2002, a long-term groundwater monitoring plan had been developed by

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2 MDEQ did not concur with the 2003 ESD partially because aluminum, iron and sodium exceeded State of Michigan Part 201 groundwater criteria for residential usage protection in groundwater samples from certain monitoring wells in the Paint Shop source area, and, therefore, MDEQ believed that the ESD should have categorized aluminum, iron and sodium as contaminants of known concern and provided a cleanup criteria for these contaminants.

consultation among Progressive, the VWF Group, USGS, MDEQ, and U.S. EPA staff. The plan addresses sampling by the VWF Group for the blocking well / Annex / Paint Shop pump-and-treat system, and the Annex pump-and-treat system; by MDEQ for the TSRR pump-and-treat system; by Davis Oil on its facility; and the City for well field production wells. The plan provides for annual sampling of pumping wells and sentinel wells; some quarterly sampling of sentinel wells; and sampling of selected monitoring wells at one to five-year intervals. The plan also provides for extensive hydraulic monitoring during the first year of operation of the enhanced system, and generally requires annual hydraulic monitoring thereafter.

2006 Federal Consent Decree: The Federal Consent Decree requires that the VWF Group utilize quality assurance, quality control, and chain of custody procedures for all data used for the following purposes: to assess achievement of the CUOs; and to assess protection to the City well field (see *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operation* (EPA QA/R5) (EPA/24/B-01/003, March 2001). All laboratories must participate in a U.S. EPA or U.S. EPA-equivalent quality assurance/quality control program.

2006 State Consent Decree: The State Consent Decree specifies points of operational compliance for the NBWs, the SBWs, and each source area.

5. Soil Clean-up:

1991 ROD and 2003 ESD: Site specific CUOs for VOCs in source area soils were identified in Table 17 of the 1991 ROD. The soil CUO for each VOC was the lowest concentration among the following clean-up goals:

- the concentration in soil estimated to produce an incremental lifetime cancer risk of 1×10^{-6} due to soil ingestion using a residential scenario (called the Cancer Risk Goal in Table 17);
- the concentration in soil estimated to produce an exposure rate equal to the reference dose for health effects other than cancer due to soil ingestion using a residential scenario (called the Risk-Ratio Goal);
- the concentration in soil that may produce leachate having a concentration equal to the cancer risk goal for carcinogens, or equal to the MCL for non-carcinogens assuming a 20 X dilution/attenuation factor (called the TCLP Estimate for Ground-water Protection); and
- the Michigan Act 307, Type B soil clean-up criteria (the Michigan Act 307 criteria was conservatively estimated to be a concentration in ug/kg in soil that may result in a groundwater concentration equal to the Michigan Type B groundwater clean-up criteria using a 20X dilution/attenuation factor).

In accordance with Section 6 of Michigan Act 307, the latter two goals could be replaced with a comparison of the results of leachate tests with the groundwater CUOs.

The soil CUOs were updated in the 2003 ESD (see attached Table 1 from the 2003 ESD). The updated standards include using the Part 201 Generic Residential Drinking Water Protection criteria from Michigan Act 451 to replace the Michigan Act 307 Type B criteria. Because soil data for SVOCs, metals, pesticides and PCBs was very limited, additional soil sampling for these analyte groups was conducted in 2002. Based on this sampling in the ESD, U.S. EPA decided that cleanup of source area soils for these contaminants was not necessary, and, therefore, no CUOs were identified for these groups of contaminants in the 2003 ESD.

The 1991 ROD identified the clean closure requirements as ARARs, including 40 CFR 264.111. 264.112, 264.113, 264.178 and 264.197, and determined that the remedy satisfies these ARARs. The 1991 ROD also identified the corrective action requirements in 40 CFR 264, Subpart F as ARARs, and determined that the remedy satisfies these ARARs.

State Consent Decree: The State Consent Decree allows use of Michigan limited industrial cleanup standards for the Annex soils as long as the source area groundwater is contained, and an adequate deed notice is put in place.

6. Surface Water Protection:

1991 ROD: The ROD provides for treatment of the ground- water by air stripping prior to discharge to the Battle Creek River. ARARs identified in the ROD for the treated groundwater discharged to the Battle Creek River include Sections 304 and 402 of the Clean Water Act, and State of Michigan Water Resources Commission Act 245, P.A. 1929, as amended.

Discharge Limits: Surface water discharge requirements including monitoring and discharge limits are identified in documents issued by the MDEQ Surface Water Quality Division. These documents are the equivalent of NPDES permits. The discharge document, MI0042994, has been applicable to the discharge from the VWF treatment facility operated by the VWF Group. The discharge document, MI0054241, has been applicable to the discharge from the TSRR treatment facility by U.S. EPA and MDEQ.

Annex Pipeline: The Annex groundwater formerly contained listed hazardous wastes. In the 2003 ESD, U.S. EPA determined that RCRA regulation, 40 CFR 264.193 should be considered a relevant and appropriate requirement for the Annex pipeline. This regulation would require that the Annex pipeline have secondary containment and a leak detection system (265.193(f)) unless a variance is approved (265.193(g)).

7. Protection from Air Emissions:

1991 ROD: *The 1991 ROD provides for carbon adsorption treatment of the air* discharge from air strippers used for groundwater treatment. ARARs identified in the 1991 ROD for the air discharge include the Michigan Air Pollution Control Act, P.A. 1965, as amended, and Michigan Act 348. In addition, best available control technology was required for new VOC emission sources.

Air Discharge Documents: MDEQ Air Quality Division issued an air discharge document dated October 1996, to provide monitoring requirements and discharge limitations for the emissions from the VWF air stripper being operated by the VWF Group. Quarterly sampling of the carbon system influent and effluent was required. This document was updated on August 2, 2001, to include a determination by MDEQ that it was confident that the emission would comply with the air discharge limitations without treatment under current operating conditions and approved deactivation of the air phase treatment system. MDEQ provided that future changes to the remedy would have to be evaluated to determine any potential for increased contaminant loading, in which case the VWF Group would need to submit a request to the MDEQ, Air Quality Division.

8. Off-Site Disposal Protection:

The 1991 ROD determined that VOC contaminated groundwater and source area soils contained RCRA listed hazardous wastes. Therefore, off-Site disposal of VOC contaminated groundwater or soil residuals must be in accordance with RCRA requirements for hazardous waste, pursuant to U.S. EPA's contained-in policy. Section 17 of the Federal Consent Decree requires the following:

- Prior to any off-site shipment of waste material exceeding 10 cubic yards from the Site to an out-of-state waste management facility, the VWF Group must provide notification to the appropriate state environmental official, and to the U.S. EPA project coordinator (Section 17 also defines the contents of the notification); and
- Prior to shipping any hazardous substances, pollutants, or contaminants from the Site to an off-site location, the VWF Group must obtain U.S. EPA's certification that the proposed receiving facility is operating in compliance with federal and state requirements, and the unit to which the hazardous substance, pollutant or contaminant is to be shipped is not releasing contaminants into the groundwater, surface water or soil, and all releases from other units at the facility are being controlled by a corrective action program.

9. Access Restrictions, Deed Restrictions, and Institutional Controls:

Federal Consent Decree: The Statement of Work attached to the federal Consent Decree requires fences around the treatment equipment to prevent access to contaminated soils at the Annex and Paint Shop except where fencing would interfere with operations at Grand Trunk. Warning signs are required on all gates and on fence structure. The Federal Consent Decree requires that Grand Trunk file a deed notice, provide a notification to the grantee and U.S. EPA prior to selling property on the Site, and refrain from using the Site in a manner that would interfere with the implementation, integrity or protectiveness of the remedy (other than activities necessary for railroad operations. The federal Consent Decree requires that if any access or land/water use restrictions are needed on property not owned by the VWF Group, the VWF Group will use best efforts to secure from the owners an agreement to provide access, and an agreement to refrain from usage of the property in a manner that would interfere with the implementation, integrity, or protectiveness of the remedy; or if needed cooperate with U.S. EPA to secure government controls.

State and City Consent Decrees: The State Consent Decree requires a fence around the Annex source area as long as soil exceeds industrial criteria, or remedial equipment is operating on Site. The State Consent Decree requires that Grand Truck file a restrictive covenant that as a minimum restricts the Annex source area to industrial use, and prohibits groundwater consumption. Grand Trunk is required to notify MDEQ of any violation of the land use or resource use restrictions.

The State and City Consent Decrees require development of a VWFMP between the City, MDEQ, and the VWF Group. The Consent Decrees commit the City and the State to cooperate in operation of the City's well field production and MDEQ's operations of the TSRR pump & treat system so that their actions are coordinated with the remedial actions that the VWF Group is required to undertake under the Consent Decrees.

10. Davis Oil Cleanup:

The Davis Oil facilities are not source areas for this Site. However, free product from the Davis Oil property across Raymond Road from TSRR is interfering with the TSRR groundwater cleanup. Owners of underground tank systems need to comply with procedures in Part 213 of the State of Michigan regulations.

B. Remedy Implementation as of the First Five-Year Review

An assessment of the remedy implementation through September 2002, is included in Section V of the *First Five-Year Review Report for Verona Well Field*, September 2002. It can be summarized that:

- U.S. EPA's conversion of City water production wells into a blocking well system in 1984 was successful in preventing the contamination from reaching the northern part of the Verona Well Field and, thereby, protecting the City water supply;
- by the date of the *Preliminary Closeout Report* in 1997 all components of the remedy required in the 1991 ROD had been properly constructed including the SVE systems and pump-and-treat/blocking well systems (except for pump-and-treatment of the down-gradient plume area of TSRR, which had been overlooked);
- in 1997 and 1998, operational difficulties with the two-line blocking well line system resulted in frequent shut-downs, but these difficulties were eventually addressed and down-times decreased;
- investigations had been properly conducted;
- approved groundwater monitoring plans were in place;
- closure demonstration sampling was completed by U.S. EPA at TSRR in 1992, and the results indicated that VOC concentrations were generally near the soil CUOs;
- closure demonstration sampling had not been completed for the Annex or Paint Shop SVE systems, but an approved final sampling plan was in place, and available data indicated that VOC reductions were substantial;
- the City and MDEQ were concerned that contaminant break through was occurring through the blocking well and Paint Shop pump and treat system, and about protection of the City water supply at higher City water pumping rates;
- U.S. EPA and MDEQ were concerned that the Annex and Paint Shop pump and treat systems were not adequately containing the source area groundwater;
- from 1998 – 2002 a much more thorough investigation, monitoring, and modeling of the blocking well and pump-and-treat systems was conducted in response to MDEQ and City concerns;
- starting in 1999 during the summer months, the VWF Group increased the pumping rate in three blocking wells to reduce the potential for breakthrough;
- the available sentinel well monitoring data indicated that the blocking well system was removing most of the groundwater contamination and was providing adequate protection to the City water supply, but groundwater modeling indicated that breakthrough of contaminated groundwater could be substantial if City water pumping rates exceeded 17 mgd;
- as a result of the cleanup actions and natural attenuation, VOC concentrations had reduced substantially in groundwater near the NBWs, and in the TSRR, and Paint Shop source areas; VOC concentrations had remained relatively constant in groundwater near the SBWs; and the results for the Annex source area were mixed;
- because of reduced contaminant concentrations in the vicinity of the blocking wells, breakthrough of contamination no longer would be considered an emergency;

- Grand Trunk was working on formal deed restrictions to prohibit groundwater usage;
- the VWF Group and MDEQ were working with Townships to pass groundwater usage restrictions;
- the City was working with MDEQ and the VWF Group on a Verona Well Field Management Plan to coordinate the City's well field production with the blocking well operations;
- groundwater contamination from TSRR partially underlies property directly west of TSRR, which is the site of a gas station owned by Davis Oil Company, and because of gasoline and diesel spillage on the property, Davis Oil was implementing a groundwater monitoring program under the State of Michigan's Part 213 rules.

C. Institutional Controls and Access Restrictions

Compliance with ICs is necessary to assure long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure. As part of this five-year review, U.S. EPA requested an IC evaluation from the VWF Group, and information from MDEQ. Each area where ICs were necessary to assure protectiveness was identified. Institutional controls include Consent Decrees, a deed notice on Grand Trunk property including the Annex and Paint Shop, State ownership of TSRR, City ownership and operation of the City water production wells, the Calhoun County well permit program, Township ordinances, and Township and City zoning and land use plans. Access controls through fencing, and security measures are also measures necessary to assure protection. The map in Attachment 2 was prepared to show the contaminated areas, and the IC areas. Institutional control monitoring includes O&M visits by MDEQ and the VWF Group, an annual evaluation and interviews by the VWF Group, an annual notice to the Calhoun County well permit program by the VWF Group, and an annual notifice to a residence having a private well by MDEQ. A preliminary legal review of the deed notice was completed, and mapping confirmed that the deed notices are on the proper locations.

At U.S. EPAs request, the VWF Group submitted *Institutional Controls Study* (ICS) in May 2007. The goals of the ICS are to:

- evaluate whether current ICs implement required objectives/performance standards;
- identify and recommend any corrective measures to existing ICs necessary for their effectiveness; and
- recommend any new or additional ICs necessary.

The ICS addresses the whole Site except for portions relating only to TSRR. In the ICS, the VWF Group commits to providing an annual certification to U.S. EPA that the ICs were maintained and complied with during the reporting period.

U.S. EPA evaluated the ICS and, with supplemental information from MDEQ, performed an IC evaluation for the TSRR portion of the Site. U.S. EPA has determined that the ICs are adequate to protect human health and the environments with the following exceptions: for the Annex and Paint Shop, it is unclear whether the deed notice binds future owners to existing restrictions; and 2. businesses and property owners located adjacent to source areas or near the groundwater plume have not been notified that vapor intrusion, if it occurs, could cause a risk if the property is used for residential purposes.

Table 14 summarizes the IC evaluation for the whole Site. Each row corresponds to an area where ICs are necessary for protectiveness. Further discussion of the deed notice, and each IC area follows Table 14.

TABLE 2: SUMMARY OF IC EVALUATION

IC Area: IC or Access Control Needed	IC or Access Control In Place	IC or Access Control Monitoring In Place	IC Changes / Additions
City property: prevent damage to / injury from monitoring, groundwater pumping and treatment facilities.	Fencing. City access controls based on Department of Homeland Security guidelines.	The ICS provides for weekly O&M visits, and periodic interviews with City staff regarding check-in procedures.. City monitoring of access controls based on Department of Homeland Security guidelines. Communications required in ICS, VWFMP, and Consent Decrees.	None
Pipeline from Annex to VWF treatment facility: Prevent / detect damage to off-site pipeline.	O&M Manual requires corrective actions in case of problems observed.	*Operation and Maintenance Manual* requires flow and pressure recording once per week.	None
Annex property: prevent damage to / injury from monitoring, groundwater pumping and air sparging facilities; prevent exposure to soil and groundwater until CUOs achieved	Fencing and signs. Grand Trunk access controls. O&M visits. Deed notice. Calhoun County well permits. City of Battle Creek zoning.	ICS provides that weekly O&M visits will include inspection of fence and signs, and verification that there is no unacceptable usage of property or groundwater. ICS provides that prior to any property transaction, the VWF Group will verify that party is aware of remedy and restrictions. VWF Group will provide annual notification of the extent of groundwater contamination to Calhoun County.	Evaluate deed notice, and replace if necessary

IC Area: IC or Access Control Needed	IC or Access Control In Place	IC or Access Control Monitoring In Place	IC Changes / Additions
Paint Shop property: prevent damage to / injury from monitoring, and air sparging facilities; prevent exposure to soil and groundwater until CUOs achieved	Grand Trunk access controls. O&M visits. Deed notice. Calhoun County well permits. Pennfield Township ordinances, and zoning.	ICS provides that weekly O&M visits will include determining whether Grand Trunk security / access protocols are active, and verification that there is no unacceptable usage of property or groundwater. The ICS provides that prior to any property transaction, the VWF Group will verify that party is aware of remedy and restrictions. VWF Group will provide annual notification of the extent of groundwater contamination to Calhoun County.	Evaluate deed notice, and replace if necessary
TSRR property: prevent damage to / injury from monitoring, and pump-and-treat facilities; prevent exposure to soil and groundwater until CUOs achieved	Fencing and signs. State of Michigan ownership. Calhoun County well permit program. Emmett Township ordinances and zoning.	An MDEQ contractor conducts O&M visits 3 X per week, and should record problems with the fence, and usage of property or groundwater. VWF Group will provide annual notification of the extent of groundwater contamination to Calhoun County.	None
Properties within about 100 feet of the source areas, and overlying groundwater contamination: Prevent vapor intrusion risks.	Pennfield Township, City of Battle Creek and Emmett Township zoning.	VWF Group / MDEQ O&M visits should identify new residential type development near these source areas.	Send notice to businesses and property owners whose property could have a vapor intrusion issue.
Properties overlying groundwater contamination outside source areas: Prevent exposure to groundwater. **Areas where groundwater pumping could interfere with remedy:** Restrict groundwater pumping.	Calhoun Count well permits. Pennfield and Emmett Township ordinances. Deed notice on Grand Trunk property. MDEQ inventory of existing wells. VWFMP and Consent Decrees.	MDEQ and VWF Group O&M visits. City and Township oversight. The ICS provides that prior to any property transaction, the VWF Group will verify that party is aware of remedy and restrictions. MDEQ will annually attempt to notify the only residence having a private well . VWF Group will provide annual notification of the extent of groundwater contamination to Calhoun County. Annual City updates of Wellhead Protection Plan, which includes an inventory of contaminant sources. Meetings and reports for VWFMP, and Consent Decrees.	None

Deed Notice: On February 15, 2006, Grand Trunk filed in the Calhoun County Register of Deeds a notice pertaining to the Annex property, and the Marshalling Yard, which includes the Paint shop property. This notice includes the following statements relative to usage of the property: the properties are part of the Site; the Federal Consent Decree affects usage of the property until U.S. EPA issues a Certification of Completion; and *the property will not be used in any way that would interfere with implementation of the Selected Remedy, and Grand Trunk and any subsequent owner must prevent usages of the Property that would result in unacceptable levels of human exposure to the contaminated groundwater or soil, including usage of the groundwater for drinking.* U.S. EPA has confirmed that the deed notice applies to the proper area. U.S. EPA plans to evaluate whether the existing deed notice is effective to bind future owners to property restrictions, and may propose a restrictive covenant in order to ensure the remedy's long-term protectiveness.

City Property: The Site visit for this five-year review confirmed the presence a six feet fence with three strands of barbed wire, and a locked gate controlling access to the VWF pumping and treatment facilities. Another gate about 300 feet south was open, but access controlled by the City of Battle Creek security system. In the ICS, the VWF Group committed to report problems related to improper access or usage observed during their O&M visits, and to conduct periodic interviews with City staff regarding check in procedures. It should also help that the VWFMP requires communications among the parties, including at least annual meetings among staff from the City, MDEQ, the VWF Group, and U.S. EPA.

Pipeline from Annex to VWF treatment facility: The VWF Group investigated use of the Miss Dig program to provide more protection of the pipeline, but it turned out not to be practical because the as built drawings for the pipeline can not be located. Considering that the pipeline water now meets discharge limitations, the leak detection measures to be implemented by the VWF Group should be adequate.

Annex Property: The Site visit confirmed the presence of a six foot fence with three strands of barbed wire, and a locked gate controlling access to the Annex. In addition to the notice in the chain of title, groundwater usage is restricted by the Calhoun County well permit program. Calhoun County requires a permit for all new water supply wells. The County reviews the applications and will prohibit installation of new wells in contaminated areas. Usage of the Annex property for anything other than industrial purposes is unlikely because of its location adjacent to railroad tracks, because the City of Battle Creek has zoned it for industrial usage, and the City of Battle Creek's future land map identifies it for industrial usage. To monitor the IC and access controls, the VWF Group has agreed to identify any problems in its inspection reports, and to provide annual notifications to Calhoun County identifying the extent of groundwater contamination. It is likely that the fence, signs, deed notice, the Calhoun County permit program, the City zoning, and the IC monitoring will prevent improper usage of the Annex property and groundwater until the CUOs are achieved. However, U.S. EPA

plans to evaluate whether the existing deed notice is effective to bind future owners to property restrictions, and may propose a restrictive covenant in order to ensure the remedy's long-term protectiveness. The restrictive covenant may need to be permanent in view of the dieldrin and benzo(a)pyrene that was detected during hot spot sampling.

Paint Shop Property: The Site visit confirmed that access to the Paint Shop area was being controlled by Grand Trunk's security system. In addition to the notice in the chain of title, groundwater usage is restricted by the Calhoun County well permit program. Calhoun County requires a permit for all new water supply wells. Usage of the Paint Shop property for anything other than industrial purposes appears to be unlikely because of its location next to railroad tracks, and because it is identified for industrial purposes on the Pennfield Township Land Use Plan. In the ICS, the VWF Group has agreed to identify any improper access or usage in its inspection reports, to verify that check-in procedures are being followed, and to provide annual notifications to Calhoun County identifying the extent of groundwater contamination. It is likely that the fence, signs, deed notice, Calhoun County well permit program, the Township zoning, and IC monitoring will prevent improper usage of the property and groundwater until the CUOs are achieved. However, U.S. EPA plans to evaluate whether the existing deed notice is effective to bind future owners to property restrictions, and may propose a restrictive covenant in order to ensure the remedy's long-term protectiveness.

TSRR Property: The Site visit confirmed the presence of a six foot fence with three strands of barbed wire, and locked gates to controls access to TSRR. Usage of the TSRR property for anything other than industrial purposes is unlikely because the TSRR area is zoned for light industrial purposes by Emmett Township. MDEQ should record any access or usage problems observed. The VWF Group will provide annual notifications to Calhoun County identifying the extent of groundwater contamination. The fence, signs, State of Michigan ownership, Calhoun County well permit program, Township zoning, and IC monitoring will prevent improper usage of the TSRR property and groundwater until the CUOs are achieved.

Properties within about 100 feet of the source areas, and overlying groundwater contamination: Soil gas sampling could be performed to better define the potential for vapor intrusion to cause a risk, but conservative modeling has screened out the need for further sampling under existing property usage. There could be a significant risk if a property adjacent to the source areas or overlying the contaminant plume is developed for residential purposes. Such new development of areas adjacent to the Annex, Paint Shop, TSRR, or overlying groundwater contamination is very unlikely because these areas are zoned for, and/or planned for industrial purposes by the City of Battle Creek, Emmett Township, and Pennfield Township. Some of these areas are owned by Grand Trunk and are subject to the deed notice, but other areas are owned by parties who have not been notified of the possibility of vapor intrusion.

To provide further protection, the VWF Group should provide notification to businesses and property owners where new structures have the potential to be affected by vapor intrusion from the Annex, Paint Shop, or their down gradient groundwater contamination. Similarly, U.S. EPA should provide notification to businesses and property owners that have the potential to be affected by vapor intrusion from TSRR, or from groundwater contamination down gradient from TSRR. Notification should not be required where conservative screening level modeling demonstrates that the VOC contamination does not have the potential to cause an incremental lifetime cancer risk exceeding 1×10^{-6} using a residential development scenario.

Properties overlying groundwater contamination outside source areas: The Calhoun County permit program provides an effective means of preventing the installation of new wells throughout the areas of groundwater contamination. The Pennfield and Emmett Township ordinances provide additional controls on installation of new wells by prohibiting new water supply wells in locations where public water service is reasonably available. These ordinances should prohibit installation of new wells in the residential areas and along the main roads because these areas are already served by a public water service.

As can be seen from Attachment 2, much of the area of contaminated groundwater underlies City or Grand Trunk property. Both the City and Grand Trunk are well aware of the contamination problem, and are required by Consent Decrees and the VWFMP to keep up to date on the status of the cleanup. Furthermore, within the Grand Trunk marshalling yard, the deed notice puts future owners on notice of the presence of groundwater contamination.

In 2005, MDEQ conducted a search for existing residential wells in the area east of Pickford Ave., west of Brigden Ave, and north of Emmett St. (see Attachment 4) by comparing water bill records with existing addresses. Only one house was found that was not connected to the public water service. MDEQ attempted to contact the owner of this house and to sample the well, but the house appeared to be abandoned. MDEQ has committed to attempt to notify the owner of this house annually about the groundwater contamination.

Areas where groundwater pumping could interfere with remedy: Through the Calhoun County well permit program, any request for a new water supply well within 0.5 mile of the contamination will be closely reviewed to assure that it will not draw in contaminated groundwater (see 0.5 mile delineated area in Attachment 2). The City water production pumping has the potential to pull groundwater contamination through the blocking well system if pumping rates from some of the southern production wells are too high. The City agreed to distribute its pumping in a way that would minimize interference with the blocking well system. The City Consent Decree and the VWFMP requires that the City notify the VWF Group when their pumping rates increase or when there are significant changes in the distribution of pumping. Usage of groundwater under Grand Trunk

property in a manner that would interfere with the remedy is prohibited in the deed notice.

Assessment of Monitoring and Compliance with ICs: The Federal Consent Decree requires U.S. EPA approval of any change in the IC work by the VWF Group, including a change in the restrictive covenants. The IC work by MDEQ does not require U.S. EPA approval. Notifications of changes to the City water pumping is required under the City Consent Decree. The IC work by Calhoun County are not under the control of U.S. EPA, but they are implementing State of Michigan requirements. Calhoun County will receive an annual notification of the extent of groundwater contamination. U.S. EPA receives monthly progress reports from the VWF Group and MDEQ that includes Site inspection reports. There have been no reports or observations of improper property or groundwater usage.

V. Progress Since the Last Five-Year Review

Section X of the *First Five-Year Review Report,* contains the following protectiveness statement:

> *The remedies for the entire Site are protective in the short-term because there is no evidence that there is current significant exposure. In order for the remedy to remain protective in the long term, the following actions are needed, which are not already provided for in enforceable documents or agreements:*
>
> - *implementation of measures to provide protection to the City water supply in case demand increases;*
> - *incorporation of certain SVOCs and metals into the source area monitoring and cleanup requirements;*
> - *implementation of screening-level sampling of source area soils for SVOC, pesticide/PCB, and metals contamination, and any significant risks from these parameters need to be addressed prior to release of control over these properties;*
> - *implementation of actions to comply with 40 CFR 264.193 for the portion of the Annex force main going through the storm sewer.*

The status of actions recommended in Section IX of the *First Five-Year Review Report* are summarized in the table on the following page.

TABLE 3: STATUS OF RECOMMENDATIONS FROM THE FIRST FIVE-YEAR REVIEW

RECOMMENDATION	STATUS DURING LAST FIVE YEARS
Continue O&M	Ongoing. The VWF Group's O&M of the two-line blocking well / Annex / Paint Shop pump-and-treat system has continued. MDEQ's O&M of the TSRR pump and treat system has continued.
Protection to City water supply in case of increased production up to 30 mgd	Completed. State and City Consent Decrees including this requirement were entered into court in 2006. Construction of the enhanced system was completed in 2004.
Design and construct expansions to the Annex and Paint Shop pump-and-treat systems	Completed. The VWF Group completed construction in 2004. Hydraulic monitoring indicates that the expanded systems have improved capture of contaminated groundwater at the Annex and Paint Shop.
Further evaluate groundwater capture at TSRR	Ongoing. MDEQ has incorporated an evaluation of groundwater capture in the annual reports, and recently conducted an evaluation of the extent of capture at relatively low pumping rates. MDEQ plans to perform capture zone evaluations before and after relocation of one of the pumping wells.
Screening-level sampling for SVOCs, pesticides, PCBs, and metals in source area soils	Completed by U.S. EPA and MDEQ. The sampling confirmed the ROD decision that SVOCs, pesticides, PCBs, and metals contamination did not need to be cleaned up in any of the source area soils.
Approve ESD, and incorporate certain non-VOCs in source area groundwater monitoring	Accomplished. U.S. EPA approved the ESD in September 2003. Source area sampling demonstrated that the only non-VOC that needs to be included in the long-term groundwater monitoring is arsenic at the Annex.
Actions necessary to comply with 40 CFR 264.193	Completed. The VWF Group implemented a leak detection program and provided documentation that a leak in the Annex force main would have a de-minimis impact on the Battle Creek River. Based on these additional actions, and information, U.S. EPA and MDEQ determined that the pipeline satisfied the technical requirements of 40 CFR 264.193.
Negotiate a consent decree incorporating ESD requirements	Accomplished. The consent decree between the VWF Group and U.S. EPA was entered in court in January 2006.
Eliminate unnecessary air and water treatment	Ongoing. To date MDEQ has not evaluated whether air or water treatment can be discontinued, but plans to conduct such an evaluation during 2007. With U.S. EPA and MDEQ approval, the VWF Group discontinued unnecessary treatment of the air stripper air emissions in 2001, of the NBW flow in 2003, and of the Annex and SBW flows in 2007. In the near future, the VWF Group plans to submit a proposal for shutting down the NBWs.

RECOMMENDATION	STATUS DURING LAST FIVE YEARS
Evaluate whether TSRR soil achieves CUOs	Ongoing. The results of soil sampling by MDEQ in May 2005 has reopened this issue. MDEQ reviewed the 1992 TSRR soil data and determined that it identified a potential hot spot that needed to be investigated. MDEQ sampling in May 2005 indicates that the remaining VOC concentrations are higher than previously believed based on the 1992 data. In response to this data, further soil treatment may be necessary.
Implement soil sampling at the Annex and Paint Shop, in accordance with the *Soil Verification Sampling Plan*	Planned for the future. The VWF Group is voluntarily continuing treatment of groundwater hot spots at the Annex and Paint Shop using air sparging. The final soil sampling should not be performed until after the air sparging is completed.

Following are summaries of the results of the evaluation of progress during the last five years on different aspects of the project.

1. Groundwater Monitoring and Quality Assurance/Quality Control of Data: All sampling and analyses by the VWF Group and MDEQ were conducted in accordance with approved plans. The investigations conducted to determine to what extent SVOCs, pesticides, PCBs and metals analyses needed to be included in the long-term monitoring and soil sampling were properly conducted. The decisions to restrict long-term groundwater monitoring to VOCs and arsenic (Annex only) were proper and well documented. Water discharge monitoring is conducted monthly by the VWF Group and MDEQ in accordance with the discharge monitoring requirements. Data from samples of City water production wells are considered in evaluating the performance of the blocking well system. The City of Battle Creek samples their water production wells on a monthly and quarterly schedule in accordance with procedures required in the program for the Safe Drinking Water Act. The samples are presently being analyzed by the MDEQ Drinking Water Laboratory.

VWF Group Groundwater Sampling: For all sampling and investigations by the VWF Group, Progressive submitted sampling plans and quality assurance project plans (QAPPs) that were reviewed and approved by U.S. EPA. The VWF Group prepared an updated QAPP in December 2003. Progressive's sampling included annual groundwater sampling and hydraulic monitoring and quarterly sampling of sentinel wells for the Paint Shop pump and treat and blocking well system and the Annex pump and treat system, in accordance with the *Groundwater Monitoring Plan*, which is attached to the Federal and State Consent Decrees. The *Groundwater Monitoring Plan* provides that future monitoring will generally consist of annual water level measurements and annual sampling of wells. More comprehensive monitoring may be triggered if the City exceeds a water production milestone as defined in the State and City Consent Decrees.

In addition, the VWF Group conducted the following groundwater monitoring:

- in 2002, metals background groundwater sampling (analyses were conducted by MDEQ's laboratory);
- in 2002, baseline groundwater sampling for certain SVOCs and metals, for which there was insufficient data, at the Annex and Paint Shop;
- in December 2003, an air sparge pilot test at Annex;
- 2003 - 2005, special hydraulic monitoring, including continuous water level logging on three piezometers that form a line north from the NBWs (towards the City pumping wells) to test for achievement of a continuous backward gradient (one piezometer well is near the line and between two blocking wells, one is about 150 feet from the line, and the third is about 250 feet from the line);
- 2003 - 2005, special hydraulic monitoring, including continuous water level logging on three piezometers that form a line north of the SBW line to test for creation of a backward gradient from the western part of the SBW line (one piezometer is between two blocking wells, one is about 80 feet from the line, and the third is about 280 feet from the line);
- 2003 - 2005, special hydraulic monitoring, including continuous water level logging for one year to assess achievement of continuous containment of the northeastern corner of the SBWs and containment of groundwater contamination from the Paint Shop;
- quarterly sampling of certain monitoring wells at the Annex since November 2004, and at certain monitoring wells at the Paint Shop since late 2005 to evaluate the effectiveness of the air sparge systems;
- from September 15, 2003 to October 22, 2004, additional water level surveys were conducted to evaluate the response of the groundwater to shallow groundwater pumping at wells (ARW-1S and ARW-2S);
- since November 2004, additional water level surveys were conducted to evaluate the response of the aquifer to the air sparging.

MDEQ Groundwater Sampling: MDEQ has operated and monitored the TSRR pump-and-treat system from 1987 - 1996, and from December 1997 - present.

Hydraulic data from the Davis Oil wells is needed for preparation of potentiometric surface maps for the Site and is collected annually by Davis Oil, and chemical data from Davis Oil wells helps in monitoring the TSRR groundwater cleanup and is collected quarterly by Davis Oil. Recently, MDEQ incorporated a number of the Davis Oil wells into the formal monitoring plan for TSRR for use as hydraulic monitoring points, and groundwater sampling wells.

Since 1999, under MDEQ oversight, Davis Oil has conducted groundwater and free product investigations. The groundwater investigations have included quarterly

groundwater sampling, water level measurements, free product measurements, and submission of free product recovery status reports, which include an assessment of groundwater flow, data trends, free product thickness and volume removed, and information on cleanup alternatives. In a January 18, 2007 letter, MDEQ concluded that Davis Oil was not in compliance with Part 213 of the Natural Resources and Environmental Protection Act.

Additional Groundwater Sampling for SVOC, Pesticides, PCBs, and Metals: The Remedial Investigation and previous groundwater monitoring focused on VOCs, while sampling for other analytical groups was limited. The 1991 ROD required periodic monitoring of a number of SVOCs and metals (see Table 21 of the ROD). From 1998 to 2002, U.S. EPA, the VWF Group, and MDEQ conducted a review of the available groundwater data for SVOCs and metals to determine whether continued sampling for these contaminants was necessary. As a result of this review, it was determined that groundwater monitoring for most SVOCs and metals could be discontinued, but that there was insufficient data for certain SVOCs and metals.[3]

To fill this data gap, the following additional investigations were conducted in 2002 and 2003:

- the VWF Group and MDEQ cooperated in conducting a background groundwater survey for metals;
- the VWF Group conducted baseline groundwater sampling (three rounds of sampling) at three of the most highly contaminated groundwater monitoring wells at the Annex and two at the Paint Shop for the contaminants having data gaps;
- MDEQ conducted baseline groundwater sampling (four rounds of sampling) at five monitoring wells at TSRR for contaminants having data gaps.

The results of the background sampling were used to calculate background concentrations for metals. The results of the baseline sampling were compared to the calculated background concentrations, using MDEQ procedures, and to the MDEQ criteria for residential drinking water (6/7/2000 update). Based on this evaluation in the 2003 ESD, U.S. EPA decided that only arsenic at the Annex needed to be incorporated into the long-term groundwater monitoring, and that some additional sampling was needed only for aluminum, iron and sodium at the Paint Shop.

The 2003 ESD also required additional sampling for dieldrin, and 1,1,2,2-TCA because of detections in soil samples exceeding the Region 9 Soil Screening Levels (SSLs).[4] In

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3 TSRR: bis(2-ethylhexyl)phthalate; antimony, arsenic, beryllium, cadmium, chromium, manganese, nickel, vanadium, and zinc. Annex: bis(2-ethylhexyl)phthalate; nitrobenzene; hexachloroethane; arsenic; vanadium; and zinc. Paint Shop: bis(2-ethylhexyl)phthalate; n-nitroso-di-n-propylamine; aluminum; arsenic; cadmium; iron; lead; manganese; sodium; vanadium; zinc.

4 Groundwater sampling for 3,3'-dichlorobenzidene was not required even though it exceeded its SSL in a soil sample at the Annex for the following reasons: there is no record of disposal of this chemical; it was

2004, three rounds of groundwater sampling were conducted at the Annex for dieldrin, and 1,1,2,2-TCA. Because no dieldrin or 1,1,2,2-TCA were detected, U.S. EPA approved discontinuation of that monitoring. Groundwater sampling for aluminum, iron and sodium was conducted at selected Paint Shop monitoring wells during 2004 to 2005. Because no risk to the Verona Well Field was identified from aluminum, iron and sodium groundwater contamination at the Paint Shop, this sampling was discontinued in 2006.

2. Soil Investigations, and Quality Assurance/Quality Control of Data: There had been little or no previous soil sampling for pesticides, PCBs, or metals, and SVOC at TSRR (see the *First Five-Year Review Report*). In response to this data gap, in March 2002 MDEQ collected two surface soil samples, and seven soil boring samples from the formerly most contaminated areas of TSRR for analysis of SVOCs, pesticides, PCBs and metals. The samples were analyzed by the U.S. EPA, Region 5, Central Regional Laboratory, in accordance with their procedures. The data was compared to the Michigan residential soil criteria for protection of drinking water, and direct contact (June 7, 2000 update). Based on these comparisons, U.S. EPA and MDEQ determined that further soil sampling for SVOCs, pesticides, PCBs and metals at TSRR was not necessary because none of the data exceeded the Michigan criteria.

Previous investigations had included only one soil sample at the Annex and one at the Paint Shop for analysis of pesticides, PCBs and metals, and only two at the Annex and two at the Paint Shop for analysis of SVOCs. In response to this apparent deficiency, following preparation of a sampling plan and QAPP, U.S. EPA collected soil samples from some of the formerly most contaminated areas of the Annex and Paint Shop for analysis of SVOCs, metals, cyanide and pesticide/PCBs. Soil samples were collected from nine locations at the Annex and four locations at the Paint Shop. The data was compared to the Michigan residential soil criteria for protection of drinking water, the Michigan industrial soil criteria for direct contact, for metals Michigan default background concentrations (June 7, 2000 update), the Region 9 PRGs for direct contact with industrial soil, and the Region 9 SSLs (October 1, 2002 update). For the Annex and Paint Shop, the industrial direct contact criteria were used because it is unlikely that these properties will be used for other than industrial purposes, and Grand Trunk committed to imposing a restrictive covenant with the deed that will prohibit residential usage of the property and groundwater. Based on this comparison, U.S. EPA and MDEQ decided that no further soil sampling for SVOCs, metals cyanide, pesticides or PCBs would be required.

In May 2005, MDEQ conducted additional soil sampling at TSRR to better characterize a potential VOC hot spot, and residual VOCs in smear zones created by the rise and fall of the groundwater table. MDEQ had reviewed the results from 1992 soil sampling by

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detected only once and at a concentration well below the target detection limit (24 ug/l compared to the TDL = 350 ug/l); and because the detection was within one order of magnitude of the SSL.

CH2M-Hill, and concluded that the results indicated the presence of a hot spot that should be investigated. The results of MDEQ's sampling are reported in *Hot Spot Soil and Residual Contamination Investigation Report*, MDEQ, April 2006. U.S. EPA has raised concerns about this investigation including; the lack of a QAPP; the Work Plan did not identify specific MDEQ sampling and analytical protocols that would be used; no field blanks or trip blanks were collected even though this is specified in MDEQ's Operational Memorandum No. 2; the data had not been validated; and the report includes a figure, which creates confusion about sampling locations because it shows locations that are inconsistent with the descriptions of the sample locations.

However, U.S. EPA has determined that MDEQ's 2005 data should have precedence over the 1992 data for the following reasons:

- Sample collection, preservation, and analysis procedures for VOCs in soils have improved substantially since the sampling and analyses conducted for U.S. EPA in 1992. The updated procedures were recommended by U.S. EPA in guidance issued on August 7, 1998. According to the U.S. EPA and MDEQ chemists, the 1992 results are likely to have been biased low because of VOC losses that occurred during sample handling, and it is not unexpected for VOC concentrations to be much higher using the updated sampling, methanol preservation, and analytical procedures. In 1992, CH2M-Hill removed the soil samples from the ground using a split spoon sampler. The brass sleeves from the split spoon were capped on the ends with a plastic cover, placed in a cooler, and sent to the laboratory, where the samples would be opened and mixed, and a portion removed, weighed, and then extracted. In 2005, MDEQ collected the soil samples using a macrocore sampler. The VOCs samples were immediately transferred from the macrocore into sample vials using a dedicated syringe sampler and then preserved with methanol prior to shipment to the laboratory for analysis (U.S. EPA method 5035 high concentration method as revised in MDEQ Operational Memorandum No. 2). In the MDEQ laboratory, the methanol extract was removed and analyzed, and converted to dry weight soil concentrations, in accordance with MDEQ's Laboratory Services Standard Operating Procedure Document, SOP#501.
- Because of the unexpectedly high VOC results, U.S. EPA conducted a validation review of the data. The validation included checking the raw laboratory documentation against MDEQ Laboratory Services Standard Operating Procedure Document SOP#501. From the validation, U.S. EPA has concluded that MDEQ's laboratory properly handled and analyzed the samples, and that the resulting analytical data is valid subject to listed qualifications that indicate that quantification of some of the data is less estimated.

3. Construction Quality Assurance/Quality Control: All of the construction by the VWF Group was in accordance with design plans, and construction quality assurance plans

approved by MDEQ and U.S. EPA. Project Plans for all new construction and new installations by the VWF Group were reviewed and approved by U.S. EPA and MDEQ. For the enhanced system bypass, the final enhanced system construction, and expansion of the Annex and Paint Shop pump and treat systems, this included preparation of construction quality assurance plans, which among other provisions provided for pressure testing of new piping, and testing of the automatic shut-down and alarm system. Construction was overseen by staff from MDEQ, and inspections were conducted by U.S. EPA and MDEQ staff after completion of construction. U.S. EPA and MDEQ reviewed and approved the *Construction Completion Report, Enhanced System and Annex Upgrades* dated November 5, 2004, which provided documentation for all of this construction.

MDEQ's plans to install pumping well EW3R located on Davis Oil property to replace existing pumping well EW3, were distributed to U.S. EPA and the VWF Group for review in April 2006. U.S. EPA and the VWF Group commented that the impact of relocation of EW3 on groundwater capture should be evaluated as part of the design work. MDEQ has responded that they will evaluate groundwater capture following installation of EW3R. MDEQ is in the process of updating the O&M plan.

On January 18, 2007, MDEQ issued a non-compliance letter to Davis Oil. The concerns included failure to submit a Corrective Action Plan. The lack of adequate planning documents for the Davis Oil cleanup affects the TSRR actions because of concern about drawing free product into TSRR's pumping wells. This concern will be increased when TSRR pumping wells are relocated onto Davis Oil property because operation of that pumping wells without drawing in free product will be dependent upon Davis Oil's proper O&M of the oil recovery system.

4. Protection of the City of Battle Creek Water Supply, and Assessment of the Blocking Well and Paint Shop Pump-and-Treat System's Effectiveness in Capturing Groundwater Contamination: The two-line blocking well system has been performing well in providing protection to the City water supply, capturing up-gradient contamination, and containing groundwater contamination from the Paint Shop near the property boundary.

Design and O&M of Two-Line Blocking Well System as Operated from December 1996 - May 2004: The two-line system was designed to capture all contaminated groundwater assuming a City water production rate of 12.4 mgd, and assuming that the City utilizes the pumping distribution used during the summer of 1992 (this included less than 1% pumping from restricted use wells, which are near the blocking well system). The production rate of 12.4 mgd was 80% of the daily maximum pumping rate in 1989. The design was also checked to make sure it was protective when the restricted use wells were used to generate as much as 5% of the water production. Based on model results, Geraghty & Miller proposed normal operating pumping rates of 935 gpm for the NBW line, and 1675 gpm for the SBW line. Using these flow rates and the Annex flow rate, the VWF Group was able to use the existing air stripper to treat all of the ground-

water. Unfortunately, this design provided very little flexibility to increase groundwater pumping rates because the air stripper was very near its maximum capacity. Geraghty & Miller's model predicted that this system would provide protection to the City water supply at City water production rates up to 17 mgd, but that substantial breakthrough could occur above that production rate.

U.S. EPA approved the *Operation and Maintenance Manual* (Arcadis Geraghty & Miller, October 1998, as revised by Progressive in 2000). From 1999 to 2003, the VWF Group attempted to increase the pumping rates at three NBWs by around 100 gpm during May - August to lessen the potential for breakthrough during this period of high City water pumping. Some monitoring results suggested that the two-line blocking well system may not be as effective as predicted in design documents. Continued low-level VOC detections in the sentinel wells north of the NBW line indicated that not all of the VOC contamination was being captured by the two-line blocking well system. In addition, relatively high-level detections of PCE in shallow monitoring wells near the northeast end of the SBWs indicated that VOC contamination apparently from the Paint Shop was migrating around the northeastern end of the SBW line in the shallow groundwater.

Enhanced Blocking Well System: To address these concerns and to provide protection to the City water supply at higher City water production rates, the VWF Group agreed to construct enhancements to the two-line blocking well system (see *Interim Commitment*, September 22, 2000). To determine the necessary blocking well pumping rates an updated model prepared by Geraghty & Miller, Inc. was used for the design. The model and model input assumptions were reviewed by staff from the City, U.S. EPA, MDEQ, Progressive, and the VWF Group. The draft City and State Consent Decrees provided that at this time the enhanced system be operated to protect the City water supply at City water production rates in the range of 16 to 22 mgd (monthly average rate) with a 10% margin of safety (22 mgd + 10% of 22 mgd = 24.2 mgd). The modeling determined that pumping rates in the NBWs needed to be increased to 1,665 gpm, and in the SBWs to 2,235 gpm. It was found that the westernmost blocking well in each line (V22, and GMBW-8) was unnecessary. An additional blocking well (BW-9) was added to the SBW line to contain groundwater contamination from the Paint Shop that appeared to be migrating around the northeastern corner of the SBW line in the sand and gravel aquifer (all the other blocking wells are screened in the bedrock aquifers). The improvements to achieve the higher pumping rates were constructed by the VWF Group in 2003 and 2004. Higher blocking well pumping rates will be needed to provide protection at even higher City water production rates (up to 30 mgd) required under the final City and State Consent Decrees.

Since initiation of operation of the enhanced blocking well system, the yearly maximum monthly average, and maximum daily City water production rates have been as follows:

TABLE 4: MAXIMUM MONTHLY AVERAGE AND MAXIMUM DAILY PUMPING RATES FROM THE VERONA WELL FIELD IN MGD FROM 2003 - 2006

YEAR	MAXIMUM MONTHLY AVERAGE (MONTH)	MAXIMUM DAILY (DATE)
2003	13.45 (August)	16.95 (7/31)
2004	12.23 (July)	15.49 (7/14)
2005	13.51 (June)	16.69 (6/16)
2006	12.41 (June)	16.16 (7/17)

This data indicates the City water pumping rates were placing the old two-line blocking well system (designed to capture all groundwater contamination at 12.4 mgd, and maximum capability of about 17 mgd) near its limits, but the City water pumping are well within the capability of the enhanced blocking well system (designed to capture all groundwater contamination at 24.2 mgd).

For operation and maintenance of the enhanced blocking well system, U.S. EPA and MDEQ approved the VWF Group's *Operation and Maintenance Manual*, Progressive, November 5, 2005 and updated on March 2, 2007. A *Contingency Plan for the Enhanced System and Annex Upgrades* is appended to the *Operation and Maintenance Manual*, and defines procedures for responding to trigger events, which include increases in City water production, mechanical/electrical problems, non-decreasing or increasing VOC trends in sentinel wells, loss of hydraulic capture, VOC detections in the City water influent, and other problems.

As part of the bypass construction, the VWF Group eliminated wet well pumps, which had been a source of persistent maintenance problems. The VWF Group also installed improvements to the pumping systems including: improved telemetry to automate shut-downs; additional piezometers for improved hydraulic monitoring; and quick disconnects for some of the blocking wells so that carbon treatment could be added if necessary.

The VWF Group has kept pumping rates near the design pumping rates, and has kept down-times to a minimum, even during periods of construction. The majority of downtimes during the past five years resulted from planned activities, including routine well maintenance, air stripper maintenance, and construction. The percentage of average total pumping to the design total pumping rate, and percentage uptime for the

northern blocking wells (NBWs) and sourthern blocking wells (SBWs) has been very good, as shown below:

TABLE 5: PERCENTAGE OF THE DESIGN PUMPING RATE AND PERCENTAGE UPTIME FOR THE NBWs AND SBWS FROM 2002 - 2006

YEAR	% of Design Rate Pumping NBWs	% Uptime NBWs	% of Design Rate Pumping SBWs	% Uptime SBWs
2002	104.4%	95.5%	100.2%	95.5%
2003		96.6%		96.8%
2004 (before enhancement)	105.7%	97.9%	101.9%	96.8%
2004 (after enhancement	100.6%		102.8%	
2005	101.8%	99%	102.5%	99.6%
2006	102.8%	98.5%	101.2%	98.8%

Performance appears to have improved since the enhanced blocking well system started operation. The continuous data logging on a line of three piezometers for the NBWs, identified that the enhanced system induced a backward gradient near V-26 and V-27 continuously and probably extending 300 feet from the line in the down-gradient flow direction (down-gradient if the blocking wells were not operating). Inasmuch as the NBWs are about 220 feet apart (side gradient), this data indicates that it is very likely that the NBWs induce a continuous hydraulic barrier preventing contaminated groundwater from entering the City's well field.

VOC data from the sentinel wells for the NBWs, further indicates that the enhanced blocking well system has been effective in preventing contaminant breakthrough to the City well field. The *2006 Annual Monitoring Report* includes figures plotting data from 2000 to 2006 for the sentinel wells for the NBWs (sentinel wells GM-3I, GM-4D, GM-4I, GM-5I, GM-6I, DEQ-1A, DEQ-1B, and DEQ-2A, see Attachment 4). There was a spike in VOC detections in July 2003 in GM-4D (Cis = 4.3 ug/l), GM-4I (PCE = 5 ug/l), GM-5I (Cis = 3 ug/l), and DEQ-1B (PCE= 14 ug/l). In accordance with the Contingency Plan, the VWF Group re-sampled GM-4I and DEQ-1B in August 2003 and no PCE was detected. It is possible that the spike in concentration was caused by contaminant breakthrough that occurred when the blocking well system was shut-down for construction of the enhanced system bypass during May 2003. Only trace concentrations of VOCs have been detected in the sentinel wells for the NBWs since the enhanced system was started up in June 2004.

The following table lists the total number of detections and maximum detections in sentinel wells that were repeatedly sampled from 2004 through 2006, and appears to show a general reduction in detections (in general two samples were collected in 2004, and three in 2005 and 2006; detections are in ug/l; acetone detections are ignored, and the maximum detections are listed in parenthesis).

TABLE 6: NUMBER OF DETECTIONS IN SENTINEL WELLS FOR THE NBWs SINCE START-UP OF THE ENHANCED SYSTEM

Well	2004	2005	2006
DEQ-1A	1 (PCE = 0.84)	0	0
DEQ-1B	1 (Cis = 1.1)	3 (Cis = 0.83, PCE = 2.1)	1 (Cis=0.68)
DEQ-2A	0	0	Not Sampled
GM-3I	2 (1,1-DCA=0.39, PCE = 0.72)	0	0
GM-4D	0	1 (PCE=0.73)	0
GM-4I	4 (1,1-DCA=0.46, Cis= 0.6)	2 (Cis = 0.71)	1 (Cis = 1.2)
GM-5I	1 (PCE=0.69)	1 (PCE=0.9)	0
GM-6I	2 (Cis=0.53, PCE=0.9)	0	0

The sampling results from City production wells also indicates that the blocking well system is providing protection to the City water supply. The City water influent tap has been sampled more than 15 times since November 2002, and no VOCs were detected in any of these samples. Cis, PCE, and 1,1-DCA are by far the most highly concentrated VOCs from the source areas in the vicinity of the blocking wells, so these VOCs can be used as indicators of breakthrough. Historically, trace concentrations of Cis have been detected in City production well V13, and Cis and 1,1-DCA in V36, but no Cis has been detected in V13 since 1998, and no Cis or 1,1-DCA has been detected in V36 since 2004.

Public Health Risk in Case of Breakthrough: By 2001, breakthrough was not considered an emergency situation because VOC concentrations in the vicinity of the NBWs had decreased to at most a few multiples of the MCLs. From 2004 to 2006, all samples from the NBWs and monitoring wells associated with the NBWs met the MCLs.

Effectiveness of SBWs in Enhanced Blocking Well System and Containment of Paint Shop Groundwater Contamination: Continuous data logging of three piezometers for the western side of the SBWs, identified that the enhanced system induced a backward gradient continuously probably extending 300 feet from the line near GMBW-6 and

GMBW-7 in the down-gradient flow direction. Inasmuch as SBWs are about 160 feet apart, this data indicates that it is likely that the western portion of the enhanced SBW system induces a continuous hydraulic barrier preventing contaminated groundwater from migrating north of the blocking wells.

Interpretation of the extent of shallow groundwater capture at the northeastern corner of the SBWs using water level data (and containment of the Paint Shop contamination) is more difficult because of the complications of the geologic and hydraulic system (both blocking well line influencing flow in three aquifers), and the limited number of monitoring wells screened in the sand and gravel aquifer in that area. It is unclear how far northwest or southwest the capture zone extends, but operation of BW-9 was found to have a significant hydraulic influence as far as CH108I and GM-8 (see Attachment 4). The chemical data indicates that BW-9 has been effective in drawing in the highest PCE contaminated groundwater and shifting it away from other areas (the increase in PCE in BW-9 accompanied by the decrease in PCE in GMBW-1, GMBW-2, CH-144S, CH-144I, and DEQ-8B). However, PCE is still being detected in the NBWs.

Continued low-level detections of PCE at V26 and V27 could be indicative of residual PCE contamination between the blocking well lines, or that the SBW line is still not fully capturing all of the up gradient PCE contamination, which apparently is migrating from the Paint Shop. Although it is uncertain whether operation of BW-9 is fully achieving its design objective, it appears that no further action is justified at this time as it is difficult and expensive to definitively monitor and to design improvements in this location because it involves multiple aquifers and competition between the two blocking well lines, and, because BW-9 is only about 500 feet from the NBW line where any breakthrough around the SBWs will be captured.

Proper abandonment of unused wells is also part of the effort to protect the Verona Well Field. U.S. EPA and MDEQ have approved an Interim Well Abandonment Plan (which is an attachment to the State and City Consent Decrees). Per an agreement between the VWF Group and the City, the City will conduct the initial phase of well abandonment, in accordance with the approved plan. As of December 2006, the City had abandoned 40 of the 59 wells on the interim well abandonment list.

5. O&M / Groundwater Capture for the TSRR Pump-and-Treat System:

Description of TSRR Pump-and-Treat System: The groundwater pump-and-treat system at TSRR consists of eight groundwater pumping wells (see EW2 - EW9 in Attachment 5). The pumped groundwater is treated by an air stripper with carbon off-gas treatment, and discharged to a storm sewer leading to the Battle Creek River. In general, two pumping wells are no longer used because groundwater at these wells are no longer contaminated (EW5 and EW7). The other six wells were designed to be able to operate at a cumulative design pumping rate of about 300 gpm. MDEQ operated the pump-and-treatment system under a cooperative agreement with U.S. EPA from 1987

to May 1996, and from December 1997 to May 2002. After May 2002, MDEQ assumed full responsibility for O&M of the system.

Target Groundwater Capture Zone: CH_2M-Hill estimated that the capture zone extended approximately 400 feet down-gradient and to the sides of the TSRR boundaries when the cumulative pumping rates were 250 to 300 gpm. The groundwater capture zone for the pump and treat system should include the remaining groundwater having relatively high VOCs in the vicinity of TSRR. In March 2002, MDEQ conducted vertical aquifer sampling of a temporary well installed near the present location of DEQ-9 (see Attachment 5). Up to 165 ug/l of VOCs were detected in one of the VAS samples. In addition, VAS sampling of MW-16 on the south end of the Davis Oil property detected 399 ug/l of VOCs. Permanent monitoring wells, DEQ-9a, DEQ-9b and DEQ-10 were installed in November 2004. Total VOCs detected in samples from DEQ-9a were 41.4 ug/l in November 2004, and ranged from 26 to 41 ug/l in 2005 - 2006. Total VOCs detected in DEQ-10 have ranged from 188 to 340 ug/l in 2005 - 2007. Based on this new data and considering down gradient data, U.S. EPA staff believe that the target capture zone should extend to the vicinity of DEQ-9.

Evaluation of Achievement of Target Capture Zone: MDEQ evaluations for the *2001 Annual Performance Monitoring Report* suggested that adequate capture was achieved at 170 gpm and above (see Figure 3 from *2001 Annual Performance Monitoring Report for Thomas Solvent Raymond Road*, MDEQ May 2003), extending as far west as MW9 on the Davis Oil property, and as far north as T6, and may have included DEQ-9. MDEQ water level data collected on July 12 and July 19, 2002 at groundwater pumping rates of about 160 gpm showed a similar capture zone. With the addition of DEQ-9a, and DEQ-10 in 2004, the evaluation of the extent of groundwater capture was considerably more precise. Water level data from DEQ-9a, DEQ-9b, DEQ-10 and MW4 were compared in *Groundwater Elevation Comparison, 2004 to 2006*. This evaluation indicates that the groundwater capture zone was likely to extend to the vicinity of DEQ-9, at pumping rates as low as 110 gpm (when there was a 0.15 foot gradient between DEQ-9a and DEQ-10). The gradient between DEQ-9a and DEQ-10 was reversed at a pumping rate of 82.6 gpm.

Attachment 6 shows the total pumping rates for 2004 - 2006. The pumping rates fell well below 110 gpm during the following time periods: July 22 - 28 and August 26 - November 2005. From September 26 - October 31, 2005, pumping rates ranged from 67.9 - 90.7 gpm. During these periods it is likely that groundwater capture did not include DEQ-9a. Pumping rates that were marginal for adequate capture (100 to 110 gpm) were maintained from November 2005 – February 2006. In March 2006 pumping rates were increased to about 150 gpm, but the rates gradually decreased to near 110 gpm in September 2006.

From November 2006 - August 2007, MDEQ has been generally able to maintain pumping rates within the range of 130 - 150 gpm. In March 2007, MDEQ increased the

pumping rate from EW2 from around 20 gpm to 34 - 35 gpm, which is important because it is the closest pumping well to the highly contaminated groundwater around DEQ-10. Near the end of May 2007, after further well treatment, MDEQ was able to increase the total pumping rate to over 170 gpm, and was been able to maintain pumping rates in that range through July 2007.

Causes of Reduced Pumping Rates: During much of the 2004 - 2007 time period, MDEQ operated the TSRR pump-and-treat system at pumping rates that were much lower than 160 gpm. The causes of the reduced pumping rates, include: 1. shut-down or reduced pumping of EW3 to prevent discharge of Davis Oil's free product; 2. reduced pumping capacity due to insufficient or ineffective well and piping treatment and pump maintenance; 3. reduced pumping rates due to insufficient air stripper maintenance; 4. reduced pumping capacity due to aging of the pumping wells; 5. reduced pumping capacity due to a reduction in the regional water levels; and 6. shut-downs for maintenance, including sequential week-long shut-down of pumping wells. It appears that shut-down and reduced pumping to prevent discharge of free product, insufficient treatment and maintenance of pumping wells and the air stripper, and prolonged maintenance shut-downs were the primary causes of the reduced pumping rates.

MDEQ's plan to prevent entry of free product in the effluent was to monitor and to shut-down any affected pumping well. On May 21, 2004, MDEQ's contractor, Earth Tech, identified free product in EW3 during a water elevation check, and immediately turned off the EW3 pump. The EW3 pump was off from May 21, 2004 - January 13, 2005. Subsequently, the EW3 pumping rate and possibly the pumping rates in other wells were reduced to prevent discharge of free product. MDEQ considered installation of a free product recovery system in EW3, but this was found to be impractical. Since EW3 was restarted, Earth Tech has conducted twice monthly visual inspection and measurements for free product at EW3, and visual inspection for other pumping wells monthly. To date, free product has only been observed at EW3. Twice monthly sampling of EW3 started in February 2005, and has confirmed the presence of free product constituents in groundwater from EW3. Earthtech dips out free product by hand when it is thick enough. In April 2006, MDEQ decided to install EW3R on Davis Oil property along with a free product recovery system in order to enable groundwater pumping with less concern about discharge of free product, and to increase the rate of free product removal. Installation of EW3R was expected in early 2007, but has been delayed by access negotiations with Davis Oil.

The *2001 Annual Performance Monitoring Report* (p. 12) states that generally the pumping wells are inspected tested and tested for specific capacity every three to five years, and, based on the results, are cleaned and rehabilitated as appropriate. The eight pumping wells were tested for specific capacity and chemically and physically treated in October / November 2001 and again four years later in August 2005. The field reports for 2003 - 2005 show clear signs that fouling of the wells and/or pumps was contributing to reduced pumping rates. Two of the pumping wells were again

chemically treated in May 2007. In addition to treating the wells, MDEQ has found that it is necessary to periodically treat the process piping to remove biological grown and precipitates.

Typically the air stripper should be inspected every year, and the packing material replaced every two years. MDEQ has inspected the air stripper annually. MDEQ replaced the packing material and cleaned the stripping tower in March 2000, in April 2002, in March 2004, in October 2005, and July 2007. In spite of this packing change out schedule, between August 2005 – October 2005 the pressure loss across the packing increased and resulted in the need to reduce the pumping rates. The pressure drop across the packing resulted in a shut-down of the pump-and-treat system on August 24 at a total pumping rate of 136 gpm. Subsequently, Earthtech reduced pumping rates to prevent shut-down of the air stripper, and operated the system at 80 - 100 gpm. The system shut-down again for the same reason on September 28, and Earthtech restarted and operated the system at around 68 - 84 gpm until the tower media was replaced in late October. After the tower media replacement, the system was restarted, and the pressure differential across the packing was reduced to 1 - 4 inches. However, the initial pumping rate was only 90 gpm, and only increased to around 110 gpm during November 2005.

On a number of occasions, treatment / maintenance of pumping wells were conducted sequentially, and took over a week per well. This contributed to reduced pumping rates.

MDEQ has provided some documentation that suggests that the pumping rates that are achievable following well treatment have been reduced since the system started up in 1987. The MDEQ has suggested that because of the long-term usage of the pumping wells, a larger than normal volume of aquifer surrounding the well has become partially plugged. For this reason, future well treatments will attempt to treat a larger volume of the aquifer. There has been a decrease in the regional water table, but plots of the water elevations versus pumping rates indicate that this is not the major factor in the reduced pumping rates at TSRR.

MDEQ actions to improve O&M: MDEQ is committed to improving the quality and frequency of O&M activities in order to improve the cleanup and containment of TSRR groundwater. This commitment is reflected in improved pumping rates during 2006 and 2007, and in recent submissions of the *2006 Annual Performance Monitoring Report*, and *Groundwater Elevation Comparison, 2004 - 2006*. MDEQ has stated that the new O&M contract provides for clearer scheduling of routine maintenance items such as the annual specific capacity testing of pumping wells and treatment / maintenance as needed. To further improve O&M, MDEQ intends to install EW3R and a free product recovery system on the Davis Oil property, and subsequently to operate EW3R while Davis Oil operates the free product recovery system. Subsequently, MDEQ plans to perform the following evaluations:

- evaluate the groundwater capture zone quarterly;
- conduct a more detailed evaluation of whether adequate groundwater capture was achieved during the period from 2001 - 2006;
- conduct a detailed evaluation of the impact of relocation of EW3R on groundwater capture; and
- evaluate whether air treatment can be discontinued.

Impact of Davis Oil Free Product: The TSRR cleanup overlaps with the cleanup of a floating free product and groundwater contamination on the Davis Oil property, which is located across Raymond Road from TSRR. The TSRR pump-and-treat capture zone contains the floating free product from the Davis Oil facility (compare estimated extent of free product in Attachment 7 to the capture area in Attachment 5). The TSRR pump-and-treat system is not designed to handle free product, and for that reason one of its pumping wells (EW3) has been shut-down or reduced in flow to prevent the pumping from drawing in the free product, at times pumping from other wells has been reduced, and the pumping wells are regularly monitored for free product and hazardous constituents unique to Davis Oil. Operation of EW3R, which is expected to be installed during 2007, will rely upon the oil recovery by Davis Oil to prevent free product from being drawn into the EW3R discharge.

It is clear that fouling of pumping wells, and the air stripper has resulted in reduced flow rates, increased downtimes, and increased costs for cleaning and maintenance of the pumps, pumping wells, and air stripper. Some of the system fouling may be exacerbated by the Davis Oil's free product's impact on geochemical conditions. Free product can be biologically active resulting in low dissolved oxygen concentrations and reducing conditions, which can cause high iron and manganese concentrations. The high dissolved iron and manganese groundwater can become more oxygenated in a pumping well having a well screen above the water table, can precipitate, and clog the well screen and the aquifer near the pumping wells. The potential for the Davis Oil free product to increase TSRR pump-and-treat system maintenance costs, and reduce pumping rates can be further evaluated using data on oxygen-reduction potential and dissolved oxygen from well development data.

Cleanup of the free product at Davis Oil has been a prolonged process. The first documented release at Davis Oil occurred in 1986 when a release of diesel fuel was identified, and remedial efforts began during that year under MDEQ oversight. On a later date, a 6,000 gallon underground storage tank and a 1,000 gallon underground storage tank failed tightness testing and were removed. During the removal, impacted soil was observed. Free product was detected in one monitoring well. In 1990, three unleaded gasoline underground storage tanks failed tightness tests and were removed. During removal, impacted soil was observed, and some was removed. In March 1990, Davis Oil removed additional visually contaminated soil. In February 1991, Davis Oil removed one 500-gallon waste oil tank, and its surrounding soil. Floating free product

was rediscovered in August 1999 when replacement monitoring wells were installed on the Davis Oil property. Since 1999, Davis Oil has removed free product from monitoring wells and from a recovery well by hand bailing when possible.

In 2002, free product levels increased and additional monitoring wells were installed. In 2003, forensic testing of the free product indicated that it is a middle distillate, such as diesel fuel #2 or heating oil. However, a free product sample collected in 2001 detected high concentrations of three TSRR contaminants of known concern: ethyl benzene (460 mg/kg), 1,1,1-trichloroethane (24 mg/kg), and xylene (300 mg/kg); and a free product sample collected in 2002 detected the following: benzene (0.001%); toluene 0.050%; ethylbenzene (0.015%); and xylenes (0.121%). These VOCs are not components of middle distillate, diesel or heating oil. Some of these VOCs may have been from Davis Oil's previous gasoline tank leak, and or from migration of contamination from TSRR.

As of June 2006, Davis Oil had removed 61.65 gallons of product by manual bailing. Davis Oil's consultant believes that the estimated extent of the free product has decreased since 1999. A pilot test for soil vapor extraction treatment was conducted in 2001, but it was concluded that soil vapor extraction by itself would not readily remove the free product from the water table. The pilot test report suggested that air sparging would achieve higher VOC removal rates than soil vapor extraction (letter dated February 13, 2002 from Ranger Research, Inc.). The free product recovery well near EW3R should increase the removal of free product.

On January 18, 2007, MDEQ issued a non-compliance letter to Davis Oil. Deficiencies included: not cleaning up highly contaminated soil; and not aggressively removing free product. The pace of the Davis Oil cleanup, is impacting the TSRR pump and treat system in the following ways:

- additional monitoring has been conducted for Davis Oil's free product in the pumping wells, and for Davis Oil's contaminants in the groundwater;
- pumping rates have had to be reduced to prevent discharge of free product;
- EW3R is being installed at least partially to prevent discharge of free product;
- MDEQ and U.S. EPA plan to further evaluate use of air sparging to complete the TSRR cleanup, and the presence of Davis Oil's free product and groundwater contamination will impact this work;
- there is potential that the Davis Oil contamination is increasing fouling of TSRR pumping wells and air stripper, resulting in decreased pumping rates, more down-times, and higher maintenance expenses.

Evaluations to Reduce Treatment Costs: During 2007, MDEQ plans to evaluate whether pump and treat costs can be reduced by discontinuing the vapor phase carbon treatment. MDEQ will also be considering turning off two more pumping wells because the groundwater is no longer contaminated while maintaining an adequate groundwater

capture zone. Due to influent concentrations of PCE,[5] the pending initiation of pumping of EW3R, and possible adjustments in pumping rates, MDEQ has determined that it is premature to evaluate discharge without treatment.

6. O&M / Groundwater Capture for the Annex Pump-and-Treat System: From December 1996 - September 2003, this system consisted of two pumping wells screened in the intermediate sandstone aquifer, and a pump station, which pumped the groundwater through a pipeline to the VWF air stripper. In 2000, U.S. EPA concluded that this system was not fully capturing groundwater in the sand and gravel aquifer, which contains the most highly contaminated groundwater. The VWF Group installed one shallow pumping well and conducted pump tests in 2002. By September 2003, the VWF Group had installed and initiated operation of two shallow pumping wells screened across the sand and gravel and the top of the sandstone aquifer (the sand and gravel aquifer by itself was not productive enough). The VWF Group anticipated that the two deep wells would pump at 55 and 75 gpm, and the two shallow wells would pump at 35 gpm each.

With the addition of the shallow groundwater pumping wells, hydraulic data clearly indicated that the shallow source area groundwater was being contained by the pump-and-treat system. Water levels were recorded once per day for the first 13 days after start-up, and once per month for the next 12 months. The initial total pumping rate from the two shallow wells was 23.6 gpm, and 118 gpm from the deeper wells. The VWF Group reported an operating time percentage of 95 - 97.4% during the first year of operation, but that the shallow wells had to be chemically cleaned several times during the first year because of iron fouling. In spite of the frequent chemical cleaning, the total pumping rate from the two shallow wells had decreased to 12.25 gpm during month 13, but the water levels showed that an inward gradient possibly extending beyond sentinel well MW2A.

Cis-1,2-dichloroethylene, PCE and TCE concentrations in the shallow pumping wells have been much higher than in the deeper pumping wells, and increased versus time after start-up while concentrations in the deeper pumping wells dropped. These trends confirm that the shallow pumping wells are drawing in the most highly contaminated groundwater, and keeping it from moving into the sandstone aquifer.

Unfortunately, pumping rates from the shallow groundwater pumping wells have continued to drop, and since April 2006 pumping rates have not been maintained much above 5 gpm despite frequent well cleaning and maintenance efforts. At this pumping rate, the water levels collected on July 27, 2006, did not show an inward gradient.

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5 In 2006 – May 2007, the influent to the TSRR air stripper met all of the discharge limits except for PCE, which ranged from 2.7 - 7.0 ug/l compared to the limit of 3 ug/l, and BETX, which ranged from 9.8 - 30.6 ug/l compared to a limit of 20 ug/l.

Progressive has attributed the reductions in pumping rates to iron fouling and lowering of the water table / dewatering of the sand and gravel aquifer. It should not be necessary to take further action to improve pumping rates from the shallow Annex pumping wells because groundwater concentrations in the intermediate sandstone pumping wells and the sentinel wells (MW-2A and MW-2B) have not increased, because operation of the air sparging system has resulted in a large drop in groundwater concentrations, and because the continued operation of the air sparge system is likely to result in achieving CUOs at the Annex within a few years (see Attachment 8); and because it appears that the VWF Group is doing as much as possible to maintain higher pumping rates from the shallow pumping wells.

7. VOC Removal from Groundwater: Between start-up of the two-line blocking well / Annex / Paint Shop pump-and-treat system (December 1996) through December 2000, approximately 1100 pounds of VOCs were removed by the system. From January 2001 through December 2006 more than 1,000 pounds of VOCs were removed. The rate of VOC removal has gradually decreased from nearly 300 pounds in 1997 to about 130 pounds in 2006.

Based on before and after groundwater data, Progressive has estimated that the Annex air sparging system removed about 60 pounds of VOCs from groundwater in the southern part of the Annex during its first year of operation (November 19, 2004 – November 18, 2005). Progressive estimates that only about two pounds of VOCs remain in groundwater in this part of the Annex.

In the first five-year review, it was roughly estimated that 19,000 pounds of VOCs had been removed from the groundwater between the time of initiation of operation of the TSRR groundwater extraction system in 1987 through September 2000. From October 2000 to December 2006, approximately another 460 pounds were removed. For each year from 2001 to 2004 the pounds of VOCs removed decreased by about 50% compared to the previous year. In 2002, 119 pounds were removed, and in 2005 and 2006, only 23 and 19 pounds of were removed, respectively. Lower pumping rates probably contributed to the lower VOC removal rate at TSRR in 2004 - 2006.

8. Groundwater Concentration Trends at NBWs: The remaining VOC detections in the vicinity of the NBWs are near the groundwater CUOs. The following table compares maximum VOC detections exceeding the CUOs in the NBWs and wells that may be up-gradient from the NBWs from the 2005 – 2006 sampling events, with the maximum detections from 1999 to 2000 sampling events, and with the CUOs.

TABLE 7: COMPARISON OF 1999 - 2000, TO 2005 to 2006 MAXIMUM DETECTIONS EXCEEDING 2003 ESD CUOS IN NBWs AND MONITORING WELLS POTENTIALLY UP-GRADIENT FROM THE NBWs (concentrations are in ug/l, NS = not sampled)

PARAMETER	WELL	1999 - 2000	2005 - 2006	ESD CUO
Benzene	V-25	ND	2.6	1
PCE	V-26	3.7	2.1	1
PCE	V-27	7	1.8	1
PCE	V-28	2	<1	1
PCE	W-1I	4	NS	1
VC	DEQ-7A	1.3	<1	1
PCE	GMDP-4	28	NS	1
PCE	GM-8	7.8	5.6	1
TCE	GM-8	7.6	4.4	2.5
VC	GM-2	2	<1	1

The detection of benzene in well V-25 in 2006 may be an aberration because benzene has not been detected in the vicinity of the blocking wells for many years. The primary remaining contaminant of concern is PCE. As can be seen from the table, there were small decreases in PCE concentrations in samples from V-26, V-27, V-28, and GM-8. If BW-9 is successful in cutting off the up gradient PCE, then PCE should gradually decrease as the residuals adsorbed to solids and small pore spaces are removed.

9. Groundwater Concentration Trends at TSRR: VOC concentrations in groundwater below the TSRR property are continuing to drop. The following table shows that VOCs in groundwater from the pumping wells decreased substantially between 2000 - 2001 and 2006 - 2007.

TABLE 8: CONCENTRATIONS OF VOCS EXCEEDING CUOS AT TSRR IN 2000 or 2001 COMPARED TO MOST RECENT SAMPLING (2006 or 2007 EXCEPT AS OTHERWISE NOTED, Concentrations are in ug/l)

LOCATION/PARAMETER	CUOs	2000 / 2001	2006 / 2007
Wells in TSRR source area, and pumping wells			
EW2/PCE	1	120	9.8
EW2/TCE	2.5	29	1.4
EW2/VC	1	3	<1
EW3/Cis	70	73	6.9
EW3/PCE	1	10	6.1
EW6/Cis	70	43	1.7
EW6/PCE	1	5.8	2.6
EW6/TCE	2.5	16	1.0
EW8/Cis	70	22	4.2
EW8/PCE	1	3.5	2.5
EW8/TCE	2.5	7.3	1.8
B18S/Cis	70	16	7.8
B18S/PCE	1	36	49
B18S/TCE	2.5	4.2	15
B20/PCE	1	4.5	1.4
Wells down-gradient from TSRR on DAVIS OIL property			
DEQ-10/PCE	1	(not installed)	170
DEQ-10/TCE	2.5	(not installed)	14
DEQ-10/VC	1	(not installed)	< 1
MW-2/Cis	70	270	12 (7/04)
MW-2/PCE	1	<2	89 (7/04)
MW-2/TCE	2.5	<2	21 (7/04)

LOCATION/PARAMETER	CUOs	2000 / 2001	2006 / 2007
MW-2/VC	1	11[1]	9.3 (7/04)
MW-4/PCE	1	180	120
MW-4/TCE	2.5	34	17
MW-4/VC	1	14	3.6
MW-6/Methylene chloride	5	170 (4/02)	not sampled
MW-6/1,1,2-trichloroethane	1	5.1(4/02)	not sampled
MW-6/VC	1	11(4/02)	not sampled
MW-10/Ethyl benzene	74	82 (4/02)	84 (4/05)
MW-10/VC	1	6.7 (4/02)	6.8 (4/05)
MW-14/VC	1	<5	1.7
MW-18/PCE	1	not installed	1.6 (4/05)
MW-19/PCE	1	not installed	2.4 (4/05)
MW-20/PCE	1	not installed	4.3
MW-20/TCE	2.5	not installed	2.3
Wells down-gradient from TSRR north of Emmett Street			
DEQ-9a/PCE	1	(not installed)	11
DEQ-9a/TCE	2.5	(not installed)	5.3
CH-139S/Cis	70	13	180
CH-139S/PCE	1	12	ND
CH-139S/TCE	2.5	3.9	38
CH-139S/VC	1	45	61
CH-139I/PCE	1	140	63
CH-139I/TCE	2.5	79	46
CH-139I/VC	1	18	1.6
W-6S/PCE	1	100	45
W-6S/TCE	2.5	28	13
W-6I/ Benzene	1	ND	1.2

LOCATION/PARAMETER	CUOs	2000 / 2001	2006 / 2007
W-6I/PCE	1	23	21
W-6I/TCE	2.5	120	110
W-6I/Cis	70	150	140
W-6I/VC	1	27	8.3

Many of the concentrations decreased by about one order of magnitude, although in general PCE decreased less. In 2000, MDEQ estimated that it would take 7 to 12 more years to achieve the groundwater CUOs at TSRR. This estimate would result in cleanup by 2007 to 2012, and is within the range of the estimated time for complete groundwater clean-up in the *Public Comment Draft Feasibility Study,* CH2M-Hill, February 1991 (2007 - 2017). It appears that these estimates were not unreasonable because water quality in groundwater from the pumping wells is now approaching the CUOs.

However, the data for groundwater underlying Davis Oil, and TSRR and Davis Oil soil data suggests that reaching the groundwater CUOs could take a prolonged period of time. There is not a clear indication of a drop in VOC concentrations in groundwater below Davis Oil or north of Emmett Street. The remaining area of highest VOC contamination in groundwater appears to underlie the Davis Oil property, which is not the center of groundwater pumping (see Attachment 5). The TSRR groundwater cleanup has the additional complication of overlapping with cleanup of free product on the Davis Oil property. North of Emmett Street, VOC concentrations are about one order of magnitude lower at DEQ-9 compared to concentrations on the Davis Oil property. Farther down-gradient, the VOC concentrations are generally somewhat higher in the intermediate aquifer and have been relatively unchanged.

Residual soil contamination could also prolong the groundwater cleanup. MDEQ detected 600 ug/kg of PCE in a soil boring sample located a couple feet above the water table near DEQ-10, and 450 ug/kg in a soil boring sample located a couple feet above the water table near DEQ-9. It has been suggested that the PCE detected in these borings could be residuals from a historical spread of free product from TSRR. The TSRR soil sampling by MDEQ in May 2005 identified VOCs in vadose zone soils significantly exceeding the CUOs.

Recently, in order to improve groundwater capture, and increase the rate of VOC removal in the DEQ-10 area, MDEQ has increased the pumping rate at EW2, which is the closest pumping well to DEQ-10. It is possible that MDEQ's relocation of EW3 onto the Davis Oil property will increase the VOC removal rate, but considering that EW3R will be about 100 feet up gradient from DEQ-10, it is unlikely to have much impact on

cleanup of the shallow groundwater in that area. MDEQ has ruled out location of an additional pumping well near DEQ-10 at this time. U.S. EPA and MDEQ have plans to evaluate whether use of air sparging technology, possibly accompanied by SVE, can significantly reduce the time for groundwater and soil cleanup.

Groundwater contaminants under Davis Oil that are not VWF contaminants of concern and that exceeded 2004 PRGs or MCLs are summarized in the following table (data is in ug/l). The table shows that most of the detections that exceed PRG/MCLs do not exceed the Michigan Tier 1 Risk Based Screening Levels (RBSLs), which are the required cleanup criteria under Part 213 of the State of Michigan regulations. However these contaminants migrate at a slower rate in groundwater than the chlorinated VOCs from TSRR, and are likely to eventually biodegrade in the groundwater.

TABLE 9: CONTAMINANTS OTHER THAN VERONA WELL FIELD CONTAMINANTS OF CONCERN THAT EXCEEDED PRGs OR MCLs IN GROUNDWATER UNDER OR NEAR DAVIS OIL

WELL	DATE SAMPLED	DETECTION	PRG/MCL	Michigan Tier 1 Res. RBSL's
EW3	July 2006	Benzo(a)anthracene: 1.7 Benzo(a)pyrene: 1.3 Benzo(b)flouranthene: 1.3 Benzo(k)flouranthene: 1.2 Bis(2-ethylhexyl)phthalate: 8.0 Hexachlorobenzene: 2.1	PRG =0.092 PRG = 0.0092 MCL = 0.2 PRG = 0.0092 PRG = 0.92 PRG = 4.8 MCL = 6 PRG = 0.042	2.1 5.0 1.5 1.5 6.0 1.0
MW-3	11/11/2003	1,1,2,2-TCA: 62 1,2,4-trimethylbenzene: 29 1,3,5-trimethylbenzene: 14 naphthalene	PRG = 0.055 PRG = 12 PRG = 12 PRG = 6.2	8.5 63 72 520
MW-6	4/22/2002	1,2,4-trimethylbenzene: 200 1,3,5-trimethylbenzene: 32 naphthalene: 27	PRG = 12 PRG = 12 PRG = 6.2	63 72 520
MW-10	4/1/2005	1,2,4-trimethylbenzene: 150 1,3,5-trimethylbenzene: 33 naphthalene: 36	PRG = 12 PRG = 12 PRG = 6.2	63 72 520
MW-11	4/1/2005	benzo(a)pyrene: 0.088 naphthalene: 17	PRG = 0.0092 PRG = 6.2	5.0 520
MW-12	4/8/2002	1,2,4-trimethylbenzene: 110 1,3,5-trimethylbenzene: 20 naphthalene: 52	PRG = 12 PRG = 12 PRG = 6.2	63 72 520

WELL	DATE SAMPLED	DETECTION	PRG/MCL	Michigan Tier 1 Res. RBSL's
MW-13	4/8/2002	1,2,4-trimethylbenzene: 190 1,3,5-trimethylbenzene: 42 naphthalene: 130	PRG = 12 PRG = 12 PRG = 6.2	62 72 520
MW-20	7/18/2005	1,2,4-trimethylbenzene: 86 1,3,5-trimethylbenzene: 23	PRG = 12 PRG = 12	62 72

10. Groundwater Concentration Trends at the Annex and Paint Shop: Air sparging at the Annex and Paint Shop has increased the rate of groundwater cleanup, and groundwater concentrations are approaching the CUOs. The *First Five-Year Review Report* noted that at the Annex VOC concentrations had decreased by orders of magnitude since U.S. EPA's remedial investigation, but that in general trends in source area groundwater VOC concentrations were mixed, and that shallow groundwater in the vicinity of source area monitoring wells B-8S, B-9, and B-25 still contained hundreds of ug/l of Cis, PCE and TCE.

In accordance with an agreement with MDEQ, the VWF Group constructed and on November 19, 2004, started operating an air sparging system in the southern portion of the Annex. The agreed upon period of operation of the air sparging system was one year. The air sparge system consisted of 17 air sparging wells generally spaced 30 feet apart, and a number of additional piezometers were installed to monitor the system. One year of operation of the air sparging resulted in 75 to 99% decrease in total VOC concentrations in samples from the most contaminated groundwater in the southern portion of the Annex. The air sparging also may have created aerobic conditions in the groundwater, which has apparently resulted in a drop in arsenic concentrations. Because the air sparging was very successful, the VWF Group decided to continue the air sparging treatment at the Annex beyond the one year period required under the State Consent Decree, and, in January 2006, expanded the air sparging system to include the northern half of the Annex. The expanded system continued operation of 10 of the 17 air sparge wells in the southern portion of the Annex, and added 10 air sparge wells in the northern part of the Annex at approximately 50 foot spacing. Results to date indicate that the continued air sparging of the expanded system is reducing VOC concentration in groundwater in the northern portion of the Site, and is continuing to reduce concentrations in the southern portion. In an attempt to provide some reduction in VOCs in the near down-gradient area, the VWF Group initiated air sparging at MW-2B in October 2006.

Groundwater is now approaching the CUOs in what was formerly the most highly contaminated areas of the Annex. Detections exceeding the CUOs at the Annex from the latest sampling (July or November, 2006) are summarized in the following table.

TABLE 10: MAXIMUM ANNEX GROUNDWATER DETECTIONS EXCEEDING CUOs IN SAMPLES COLLECTED IN JULY AND NOVEMBER, 2006 (concentrations in ug/l)

WELL	PCE (CUO = 1)	TCE (CUO = 2.5)	VC (CUO = 1)	1,2-DCA (CUO = 1)	Arsenic (CUO =10)
ARW-1S	1.2		4.9		
ARW-2S	19	13			
B-8S	1.1				
B-9	1.6	4.3	3.8	2.6	28
B-23	15	8.8	1.9		
B-25	32	8.5			
GMA-2D	3.3				
GMP-9S			3.3		
MW-1	1.5		1.9		
MW-2A	53	4.3			
MW-3	4.4				
MW-4	3.7				

PCE, TCE, and VC exceeded CUOs in a number of locations, and 1,2-DCA and arsenic exceeded the CUO in groundwater at B-9. The highest PCE detection was at down-gradient sentinel well MW-2A. It should be noted that there may be some rebound in groundwater concentrations when the air sparging is turned off because of contaminant desorption from solids, and migration from pore spaces.

The *First Five-Year Review Report* noted that VOC concentrations at the Paint Shop were orders of magnitude less than concentrations detected during U.S. EPA's remedial investigation, but that hundreds of ug/l of PCE remained in source area groundwater at monitoring wells CH-145, and W14. The report also noted that although VOC concentrations have been decreasing in the Paint Shop source area, the highest PCE detection up-gradient from the SBWs was at the Paint Shop.

Because of the success of the air sparging operation at the Annex, an air sparging pilot test was conducted at the Paint Shop in June 2005. Subsequently, because the pilot test results were promising, Grand Trunk continued operation of the pilot air sparge wells. The results through March 2006 indicated substantial reductions in VOC concentrations at wells east of the Car Department Building (W-14, CH-140I, CH-145I,

and PSRW-1A, see Attachment 4), but not at monitoring wells west of that building (CH-106I, W-13, CH-146I). To attempt to improve the distribution of the air, Grand Trunk started air sparging at CH-106I in June 2006. Groundwater is now approaching CUOs in what was formerly the most highly contaminated area east of the building based on data from CH-145I, PSRW-1A, and W-14. Detections exceeding the CUOs at the Paint Shop during 2006 are summarized in the following table.

TABLE 11: PAINT SHOP GROUNDWATER DETECTIONS EXCEEDING CUOs IN SAMPLES COLLECTED IN SAMPLES COLLECTED IN 2006 (concentrations in ug/l)

WELL	PCE (CUO = 1)	TCE (CUO = 2.5)
CH-106I	140	5.6
CH-140I	3.6	
CH-142I	5.9	
CH-145I	25	
CH-146I	33	12
PRSW-1A	3.2	
W-13	30	
W-14	21	

PCE exceeded CUOs in a number of locations, and TCE in two locations. In spite of the addition of air sparging at CH-106I, PCE concentrations at W-13, which is near CH-106I, only decreased slightly, and groundwater at CH-146I which is about 50 feet north of CH106I appears to be unaffected. It should be noted that there may be some rebound in groundwater concentrations when the air sparging is turned off because of contaminant desorption from solids, and migration from pore spaces.

11. Groundwater Concentration Trends at SBWs: Because high concentrations of VOCs remain in groundwater down-gradient from TSRR, the Annex, and Paint Shop, it is anticipated that the SBW line will have to continue operating for many years (this is consistent with the expectation in the ROD).

Trends in PCE concentrations appear to show that BW-9 was successful in drawing-in groundwater with the highest PCE concentrations.

During 2006, groundwater samples exceeded the CUOs near the SBWs only for PCE at BW-9, DEQ-8A, GMBW-6; TCE at GMBW-6; and VC at GMP-2D. Although VOC concentrations in the vicinity of the SBWs are relatively low, VOC concentrations at monitoring wells down-gradient from the TSRR and Annex pump-and-treat systems, and at certain Paint Shop wells remain relatively high and available data indicates that attenuation was only very gradual between 2001 and 2006:

- At Annex sentinel well MW-2A, PCE decreased from over 80 to around 50 ug/l, and TCE decreased from 10 to 4.1 ug/l;
- At well W-8I, farther down-gradient from the Annex, Cis decreased from about 110 to 55 ug/l, TCE from 35 to 15 ug/l, and PCE from 15 to 10 ug/l;
- At well W-4I, down-gradient from the Annex but near the SBWs, Cis stayed about the same at 40 ug/l while other VOCs were at low concentrations (all were below CUOs);
- At CH-139S, CH-139I, W-6S, and W-6I down gradient from TSRR, Cis, TCE, and VC apparently increased at CH-139S, while these VOCs and PCE decreased slightly at the other locations (see Table 7);
- At well CH-106 at the Paint Shop, PCE ranged from 120 - 200 ug/l with no clear downward trend, and TCE has remained around 5 ug/l (air sparging is now being conducted at this well);
- At well CH-146I, down-gradient from the Paint Shop, PCE ranged from 6 to 65 ug/l with no clear downward trend, and TCE has ranged up to 20 ug/l with no clear downward trend;
- At well W-13, down-gradient from the Paint Shop, PCE ranged from 28 to 82 with no clear downward trend.

In general, PCE and TCE concentrations are higher in the groundwater nearer the source areas and lower farther down-gradient, while Cis and VC concentrations are higher farther down-gradient. This suggests that some anaerobic biodegradation of PCE and TCE to Cis and VC is taking place as the contaminants migrate down-gradient. It has been theorized that if the historical free product release extended to DEQ-9 and beyond, the residual VOCs above the present water table could be contributing to continuing high concentrations of VOCs in the groundwater down gradient from Emmett Street.

12. Soil Clean-up and Sampling at TSRR: The TSRR SVE system was successful in removing a large quantity of VOCs from the vadose zone soils. CH2M-Hill estimated that the SVE system removed 50,000 pounds of VOCs during the period of operation from 1988-1992. The SVE system at TSRR consisted of 24 vapor extraction wells, an air/water separator, two blowers, and an off gas treatment system. Twenty-one underground storage tanks were removed from TSRR in 1991.

TSRR soil clean-up verification sampling was conducted in June 1992. U.S. EPA conducted random soil sampling including collection of more than 105 samples of vadose zone soils from 26 soil boring locations (each boring was sampled at 5 foot intervals from ground surface to the water table). All samples were analyzed only for VOCs. Based on the June 1992 sampling results, MDEQ believed that a potential VOC hot spot needed to be investigated and, therefore, conducted additional VOC soil sampling in May 2005. These data sets are compared in the following table (duplicates collected in 1992 were averaged).

TABLE 11: COMPARISON OF DATA SETS FOR 1992 TSRR SOIL SAMPLING BY CH2M-HILL AND 2005 TSRR SOIL SAMPLING BY MDEQ (concentrations in ug/kg)

	1992 DATA SET	2005 DATA SET
No. soil borings	26	8
Method of selecting boring locations	random grid locations over TSRR source area	directed sampling at potential hot spots and near pumping wells
No. sample locations	104	40
Sample collection / preservation	Split spoon, glass jar, ice	Macrocore sampler, field preservation with methanol
No. locations where PCE exceeded CUO (20 ug/kg)	11	31
Range of PCE detections	0.6 - 712 ug/kg	59 - 5,400 ug/kg
average PCE conc.	16 ug/kg (assume non-detects = 1)	460 ug/kg (assume non-detects = 30, ½ of the lowest VOC detection)
Number of locations where TCE exceeded CUO (50 ug/kg)	0	11
Range of TCE detections	1 -47 ug/kg	61 - 1,100 ug/kg
Average TCE conc.	3 ug/kg (non-detects = 1)	73 ug/kg (non-detects = 30)
Number of locations where PRG for residential direct contact exposure was exceeded (PCE=480, TCE=53 ug/kg)	0	12

As can be seen, the 2005 VOC data shows much higher concentrations than in 1992. As previously mentioned, methods for preservation of VOCs during sampling and analysis have greatly improved since 1992, and for that reason, U.S. EPA has

concluded that the 2005 data should be considered more reliable. The 2005 data indicates that PCE remains in vadose zone soils at each of the boring locations at concentrations exceeding its soil CUO, with a maximum of 5,400 ug/kg. TCE remains in vadose zone soil exceeding its soil CUO five of the eight boring locations with a maximum detection of 1,100 ug/kg. Previously, based on the 1992 data, U.S. EPA had concluded that the SVE treatment had nearly reached the CUOs, and that no further soil treatment was necessary. This decision will have to be reconsidered in light of the 2005 data. However, even using the 2005 data, it is clear that the SVE system was very successful in removing a large amount of VOCs.

13. Soil Cleanup and Sampling at the Annex and Paint Shop: SVE was performed at the Annex and Paint Shop from April 1993 through June1994. The SVE system at the Annex included 18 SVE wells and 7 piezometers. The SVE system at the Paint Shop included 4 SVE wells and 3 piezometers. VWF Group's consultant estimated that the SVE system at the Annex removed more than 4,600 pounds of VOCs, and at the Paint shop more than 2,300 pounds of VOCs. From vacuum readings, the consultant stated that the SVE system may not have influenced the entire extent of soil contamination at the Annex and Paint Shop as defined in the *SVE Systems Final Design Report,* Geraghty & Miller, July 13, 1993. The areas of influence were further reduced after October 1993 when vacuum and air flow rates for both SVE systems were reduced to lessen accumulation of water in the air/water separator, which had been causing severe operational difficulties. U.S. EPA approved temporary shut-down of the SVE systems until the water table at the Annex and Paint Shop was lowered, which was anticipated to occur as a result of operation of the pump-and-treat systems.

Preliminary soil sampling was conducted in 1996 to evaluate the effectiveness of the SVE. Nine soil samples were collected from three soil borings in some of the most contaminated areas. The results indicate that SVE was successful in removing a large quantity of VOC from soil at the Annex and Paint Shop, but is unlikely to have achieved the soil CUOs. Total VOCs at the most contaminated location of the Annex were reduced from 649,000 ug/kg to 264 ug/kg in 1996, but PCE was detected at 240 ug/kg, which greatly exceeds the CUO of 20 ug/l.

The VWF Group conducted additional soil boring sampling north of the previously defined source area at the Paint Shop during 2000. The results provide assurance that the extent of the Paint Shop source area was accurately delineated during the RI.

The final soil sampling to assess achievement of the soil CUOs is tentatively scheduled to be conducted in 2008. A *Final Soil Clean-up Verification Sampling Plan* (Progressive, January 2001) has been approved by U.S. EPA and MDEQ for evaluating the effectiveness of the soil treatment at the Annex and Paint Shop. At the Annex, generally this plan provides for collection of around 60 samples from 15 randomly selected soil boring locations and 5 directed locations (each boring will be sampled at 5 foot intervals from ground surface to the water table). At the Paint Shop, this plan

generally provides for collection of around 84 samples from 14 randomly selected soil boring locations and 7 directed locations (again each boring will be sampled at 5 foot intervals from ground surface to water table). At both source areas, a soil sample will be collected from any stained soil (based on visual observation or FID readings) encountered in the randomly selected soil borings. At both source areas, all of the boring samples will be analyzed for VOCs, and one sample from half of the randomly selected boring locations will also be analyzed for naphthalene, and bis(2-ethylhexyl)phthalate. In addition, a group of metals (arsenic, barium, cadmium, chromium, copper, manganese, mercury, vanadium, and zinc) will be analyzed on the sample collected from the sampling interval above the water table at the directed sampling locations.

Because the number of soil samples analyzed for SVOCs, pesticides, PCBs, and metals in source area soils was very limited, additional samples were collected and analyzed for these parameter groups in soil samples collected at the Annex and Paint Shop in December 2002. Based on a comparison of the results with residential PRGs, concern about these contaminants was screened out at the Paint Shop. For the Annex, dermal contact with dieldrin and certain carcinogenic polyaromatic hydrocarbons could not be screened out in case of residential exposures, but based on comparison of average concentrations to industrial PRGs, the Annex was believed to be acceptable for industrial exposures. Residential exposures were not a concern because a restrictive covenant has been added to the deed for the Annex that includes a permanent restriction on residential development of that property.

It is likely that the continued air sparging at the Annex and Paint shop is further reducing VOC concentrations in the soil. Theoretically, soil VOC concentrations could either increase (VOCs in the sparge air could condense or adsorb onto the soil), or decrease (sparge air could strip VOCs from the soil). However, because the VWF Group has continued to conduct air sparging after groundwater concentrations have dropped to low levels, it is most likely that the continued air sparging is removing VOCs in the soil to some degree. For this reason, the VWF Group should delay the final soil sampling until after the air sparging is completed.

14. Surface Water Discharge: Both the blocking well / Paint Shop / Annex pump-and-treat system, and the TSRR pump-and-treat system have complied with discharge limits. The discharge of groundwater is subject to review and assignment of discharge limits by the MDEQ specialists in the same manner as an NPDES permit.

Discharge from the blocking well and Annex pump-and-treat system: Until recently, the groundwater treatment system for the blocking well lines and the Annex has consisted of an air stripper and discharge to the Battle Creek River. Following approval by U.S. EPA and MDEQ in March 2003, the groundwater pumped from the NBWs started being discharged without treatment, and only the groundwater pumped from the SBWs and the Annex was directed through the air stripper. Since the NBWs started bypassing the

air stripper in March 2003, the influent samples to the air stripper exceeded the discharge limits only in June 2003, and May and June 2004. To evaluate whether continued groundwater treatment is necessary, in June 2005 the VWF Group started collecting monthly samples from the NBW, SBW, and Annex headers. Since June 2005, all of the SBW header samples have been less than the discharge limits. During the same time period, all of the Annex header samples have been less than the discharge limits except PCE slightly exceeded its discharge limit from June through November 2005. It should be noted that Annex header concentrations were expected to decrease and remain low because the air sparging has substantially decreased groundwater VOC concentrations. The Annex air sparge system started in November 2004, and was expanded to include the northern part of the Site in January 2006.

The VWF Group requested permission to discharge the SBW and Annex flows without treatment, and that the discharge be placed in MDEQ's inactive status, but with continued monthly discharge sampling. These requests were reviewed by U.S. EPA and MDEQ, and discharge without treatment was granted, with continued but reduced monitoring. In January 2007, the VWF Group initiated discharge of the SBW and Annex flows without treatment.

Discharge from TSRR: The TSRR groundwater treatment system consists of an air stripper and discharge to the Battle Creek River via discharge to a nearby storm sewer. Discharge of 0.5 mgd to the Battle Creek River is allowed provided that the limitations for VOCs and pH are achieved. System monitoring, discharge sampling for VOCs and pH, and reporting are conducted monthly. The sampling parameters include both TSRR contaminants of concern (such as Cis, PCE, TCE and VC), and contaminants from Davis Oil (such as naphthalene, n-propylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene). There were no detections of these contaminants in the TSRR discharge from October 2002 through June 2007, except for detections of Cis in February and March 2004 that were much less than the discharge limitation.

Water quality in the air stripper influent has been approaching the discharge limits. From October 2002 through June 2007, only PCE and total BTEX exceeded discharge limitations. PCE detections have ranged from 2.7 to 7.5 ug/l without an obvious downward trend (compared to the discharge limit of 3 ug/l). Total BETX has not exceeded its 20 ug/l discharge limitation since April 2006. Due to the influent concentrations of PCE, the pending installation of EW3R, and possible changes to pumping rates, MDEQ has determined that it is premature to evaluate discharge without treatment.

Annex Pipeline: Groundwater pumped from the Annex area is piped through a single walled 4 inch SDR11 HDPE force main to the Verona Well Field air stripper. Part of the force main is located inside a 30 inch diameter storm sewer, which discharges to the Battle Creek River. The first five-year review identified concern that leakage of VOC-contaminated groundwater from the force main into the storm sewer would be

undetected, and that the force main does not meet the requirements for secondary containment and a leak detection system in 40 CFR264.193. A leak in the force main occurred in January 2003, and was repaired during the same month.

Until 2003, there had been no defined procedures to detect leaks of contaminated groundwater into the storm sewer and then into the Battle Creek River. To address concern about leaks in the Annex pipeline, the VWF Group initiated the following measures to detect and respond to leaks in the Annex pipeline:

- an annual static pressure test;
- addition of a flow meter to measure instantaneous and totalized flow of Annex groundwater where it enters the Verona Well Field air stripper;
- visual inspection at least three times per week;
- recording the following flow measurements three times per week: flow from the Annex recovery wells; Annex flow entering the Verona Well Field Air Stripper; and Annex pipeline pressure;
- weekly evaluations of potential leaking by comparison of Annex pipeline pressure to the pressure range during normal operations; and comparison of the sum of the flow rates from Annex recovery wells to the Annex flow entering the Verona Well Field Air Stripper;
- a plan for responding to detection of a possible leak.

These procedures were incorporated into the *Operation and Maintenance Manual.* The VWF Group also provided a preliminary evaluation, which showed that the ecological impact of a short-term discharge of contaminated groundwater from the Annex to the Battle Creek River would be very minor.

From 2003 to January 2007, the VWF Group conducted the required tests, and reported the results to U.S. EPA in monthly progress reports, which are required under the Consent Decree. No leaks in the Annex pipeline were detected. Inasmuch as the Annex discharge now achieves the discharge limits without treatment, the flow rate and pressure comparisons are no longer required, but the annual pressure testing, and visual inspections will continue.

15. Air Emissions: Air emissions from the Verona Well Field air stripper have not been controlled since 2001 after MDEQ Air Quality Division expressed confidence that the emissions from the air stripper under spring 2001 conditions would comply with the SRD discharge limitations without treatment, and approved deactivation of the unit (based on data submitted in a August 2, 2001 letter from Progressive). The carbon adsorption unit remains in place and can be reactivated if necessary.

Air emissions from the TSRR air stripper have been controlled using a two in-series carbon adsorption units. The vapor phase carbon beds were last changed out in May

2002. The carbon for control of the TSRR air stripper emissions is changed based on the determination of a conservative loading capacity for the carbon change based on extensive sampling during the initial charge of carbon. This process for activated carbon replacement is designed so that there will be zero emissions. Because the VOC emission rate has decreased to low levels, the carbon does not need to be changed out frequently. After installation of EW3R, MDEQ intends to evaluate whether the air emission controls can be deactivated.

To evaluate emissions from air sparging, Progressive estimated that only 54 pounds of VOCs were present in the Annex source area groundwater, and only 3.5 pounds were present in the Paint Shop source area groundwater; and that air emissions from the initial phase of the Annex air sparging would be 0.11 to 0.86 pounds per day. Based on these estimates, MDEQ determined that no emission controls or air monitoring were required for the air sparging operations.

16. Vapor Intrusion: Exposure to VOCs in groundwater and soil can occur by migration of vapors through vadose zone soils into homes and other buildings. Using available groundwater and soil data, U.S. EPA screened for vapor intrusion risks in accordance with the *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*, EPA530-D-02-004, November 2002.

According to the OSWER guidance, empirical criteria suggest that vapor intrusion from passive migration through the vadose zone will not be significant if there is a 100 foot distance between a residence and groundwater contamination as long as no preferential pathway is present. The nearest residences are about 655 feet from the Annex and 300 feet from the TSRR, and there are no known natural or man made preferential pathways between these residences and the source areas. For these reasons, concern about passive vapor intrusion into these residences directly from these source areas is screened out.

Tier 2 screening for passive vapor intrusion was conducted on the following buildings:

- several residences that may overlie the groundwater plume down gradient (northwest) of the Annex (see Attachment 2);
- one residence located about 100 feet up gradient (south) of the Paint Shop;
- Grand Trunk engineering building located about 138 feet side gradient (southwest) of the Annex;
- Grand Trunk Car Department Building, which overlies soil and groundwater contamination at the Paint Shop;
- TSRR buildings, including a pump house and blower building near or overlying the soil and groundwater contamination, and an office about 120 up gradient (south) of the TSRR soil and groundwater contamination;

- a gas station / convenience store at Davis Oil, which is about 50 feet offset from the center of the TSRR near down gradient plume; and
- the Grand Trunk Employees Credit Union (not owned by Grand Trunk), which overlies or is near the TSRR down gradient plume.

The following table summarizes the results of the Tier 2 screening:

TABLE 13: COMPARISON OF MAXIMUM NEARBY GROUNDWATER AND SOIL DETECTIONS TO GENERIC SCREENING LEVELS IN OSWER DRAFT GUIDANCE FOR VAPOR INTRUSION

Structures	Maximum Nearby Source Conc. ug/l for groundwater ug/kg in soil[6]	Generic Screening Level from Table 2c in ug/l
Residences NW of Annex and east of Pickford Ave	PCE = 5.8 TCE = 6.5	5 5
Residence SE of Paint Shop	PCE = 21 Soil data not collected since SVE	5 Soil gas measurement recommended
Grand Trunk Engineering Building	PCE = 3.7 TCE = 1.4	5 5
Grand Trunk Car Department Building	PCE = 33 TCE = 11 Soil data not collected since SVE	5 5 Soil gas measurement recommended
TSRR buildings	PCE = 49 TCE = 15 PCE in soil = 880 TCE in soil = 82	5 5 Soil gas measurement recommended
Davis Oil convenience store	PCE = 170 PCE in soil = 600 TCE =17 VC = 3.6	5 Soil gas measurement recommended 5 2
Grand Trunk Credit Union	PCE = 45 TCE = 28	5 5

[6] Sample data from the following monitoring well or soil sample location – dates were used to represent the source concentrations: residences NW of Annex: W-8S and T-1 from 7/3/07; residence SE of Paint Shop: W14 – 11/12/06; Grand Trunk Engineering Building: MW4 – 11/13/06; TSRR office: water B18S – 5/07, soil SB14 and SB11 – 5/05; Davis Oil: water MW-4 – 5/07 and MW14 – 2005, soil DEQ10 – 2004; Grand Trunk Credit Union: W6S – 5/07 and CH139S – 5/07.

Structures	Maximum Nearby Source Conc. ug/l for groundwater ug/kg in soil[6]	Generic Screening Level from Table 2c in ug/l
	VC = 61	2

To further evaluate whether sampling should be conducted to determine whether there is a vapor intrusion risk, Site specific modeling was conducted using the Johnson and Ettinger Vapor Intrusion Model. Site specific input assumptions (other than the maximum source concentrations, which are tabulated above, and common input assumptions[7]) are tabulated below, along with the resulting calculated maximum cancer risk.

TABLE 14: CHARACTERISTICS OF BUILDINGS, EXPOSURE FREQUENCIES, AND RESULTING CANCER RISKS FOR VAPOR INTRUSION SCREENING (Res. = residences; NW = northwest; SE = southeast; GT = Grand Trunk)

Input assumption	Res. NW of Annex	Res. SE of Paint Shop	GT Eng. Build.	GT Car Dept. Build.	TSRR office	Davis Oil	GT Credit Union
Construction	base-ment	base-ment	slab	slab	slab	slab	slab
Depth below grade to bottom of enclosed floor space (cm)	200	200	15	15	15	15	15
Depth below grade to water table (cm)	616 - 764	780	487	839	770	670	730
Enclosed floor length (cm)	1219	2134	2743	8687	1830	1520	2440
Enclosed floor width (cm)	762	914	1829	762	910	914	1520
Enclosed space height (cm)	366	366	244	244	300	300	460
Exposure frequency (d/yr)	350	350	250	250	250	250	250
Maximum cancer risk X 10^{-6}	0.95	0.13	0.013	0.91	1.04	1.5	1.8

Because in the ROD U.S. EPA selected the 1 X 10^{-6} level of protection, the vapor intrusion screening results are compared to the 1 X 10^{-6} cancer risk level. The

7 For all model runs, input assumptions included the following: groundwater temp. = 9°C; soil type = sandy loam; dry bulk soil density = 1.66 g/cm^3; soil porosity = 0.3; soil water filled porosity = 0.054; floor-wall seam crack width = 0.1; indoor air exchange rate = 0.5; soil-building differential pressure = 40 g/cm-s^2 ; averaging time for carcinogens = 70 years; exposure duration for carcinogens = 25 years; enclosed floor thickness = 10 cm.

screening results show that vapor intrusion risks to residents to the northwest of the Annex and southeast of the Paint Shop, and to staff of the Grand Trunk buildings can be screened out as a concern because the conservatively estimated maximum risks are below the 1 X 10^{-6} risk level.

The cancer risk screening estimate slightly exceeds 1 X 10^{-6} at the TSRR office building, the Davis Oil convenience store and at the Grand Trunk Credit Union. However the actual risks in these buildings will not be significant for a number of reasons. First, the TSRR buildings are only occupied three days per week or about 150 days per year, not 250 as assumed in the screening model. Second, employees in all these buildings would spend much less time per day in the building compared to the screening model assumption (the screening model assumes an inhalation rate of 15 m^3 / day, which U.S. EPA found was a reasonable upper bound estimate for indoor residential activities for adults who spend the majority of their time in the home, such as housewives, household workers, retired people, and unemployed workers). Third, there would be more air exchange in these buildings than in the average building. The Davis Oil convenience store and the Grand Trunk Credit Union have frequent customer traffic. The TSRR buildings are not well insulated, and workers would come and go during working hours.

There is also potential for VOC migration from contaminated soils in the source areas. OSWER Draft Guidance advises that soil gas data be used for the risk screening if vadose zone soil contamination is present, and not to use data on total soil concentrations. Soil gas data has not been collected in the source areas. However, SVE treatment at the source areas has already removed VOCs that were readily transportable through the soil gas, and, for that reason, the vapor intrusion risks are adequately assessed using the groundwater VOC data.

U.S. EPA considered whether the air sparging at the Annex and Paint Shop has the potential to induce significant VOC migration from those source areas. Considering the following factors, concern about vapor intrusion from the air sparging operations is screened out:

- the nearest residences to the Annex are 665 feet away, and the nearest residence to the Paint Shop is about 138 feet away from the air sparging wells;
- there is no known natural preferential pathway in the sandy loam vadose zone soil;
- Progressive conducted a search of engineering drawings for potential man-made preferential pathways between the two sources and the residences, and none were found;
- the groundwater and soil VOC concentrations at the Annex and Paint Shop are much reduced;
- the air sparging operation is relatively short term lasting only a few years.

Based on the above evaluation, vapor intrusion risks are screened out. On the other hand, Grand Trunk, Davis Oil, the Grand Trunk Credit Union, and other businesses and owners of property within 100 feet of the source areas, or overlying the shallow groundwater plume should be notified of the potential for vapor intrusion.

17. Off-Site Disposal: The approved procedures for on-Site handling and off-Site disposal of residuals are summarized in Appendix C to the *Health and Safety Plan*, Progressive, October 24, 2003. Protective clothing will be decontaminated and disposed off-site. Air stripper packing material must be tested for TCLP VOCs and metals to determine disposal requirements. Prior sample results have indicated that spent packing material is a non-hazardous waste, and has been disposed of in a non-hazardous landfill. During well cleaning, the wells must be developed sufficiently to capture all chemicals used for the cleaning process. The recovered fluids must be neutralized and then slowly discharged through recovery well headers for disposal through the discharge to the Battle Creek River. U.S. EPA and MDEQ must approve all of the well cleaning chemicals.

Drill cuttings and excavated soils must be contained, and sampled for VOCs. The VOC results must be compared to MDEQ soil criteria for protection of residential drinking water. If the results are less than the MDEQ criteria, the soil can be spread onto the ground. Otherwise, the contaminated soil must be further tested for hazardous characteristics, TCLP metals, and TCLP VOCs. If the soil is found to be non-hazardous, it can be spread on the ground in a source area or transported to an off-site non-hazardous waste landfill. If the soil is hazardous, it must be disposed in a licensed hazardous waste facility. Water from sampling, well development, purging, and pipe drainage must be slowly fed into an active extraction well. Available documentation indicates that all waste materials were properly disposed of.

Spent Carbon: The only activated carbon still used on the Site is for control of emission from the TSRR air stripper. During the past five-years, no spent carbon was removed from the Site.

Air Stripper Media: MDEQ disposed of air stripper media from the TSRR air stripper three times during the last five years, in April 2004, October 2005, and August 2007. The media was disposed of as a non-hazardous waste in a nearby landfill. The VWF Group did not replace the air stripper media during the last five years. They plan to replace the media for the last time this summer, and expect it to be a non-hazardous waste.

Soil and Groundwater Residuals: In 2005, MDEQ disposed of seven 55-gallon drums of soil and three bottles of out-dated laboratory chemicals as hazardous wastes. The drums of soil went to the Michigan Disposal Waste Treatment Plant, in Belleville, Michigan, and the laboratory chemicals went to EQ Resource Recovery in Romulus,

Michigan. The drums of soil were apparently from their May 2005 hot spot soil sampling. According to 2006 field notes, Progressive disposed of purge and decontamination water in the wet well.

Well Cleaning Residuals: In 2005, U.S. EPA identified that the VWF Group's contractor was using proprietary well cleaning fluids that had not been reported to U.S. EPA or MDEQ. In response to this, the VWF Group added a supplement to the *Health and Safety Plan* (Progressive, October 24, 2003). Except in that instance, there have been no reports of the well cleaning that has not been in accordance with approved plans.

VII. Five-Year Review Process

Administrative Components: Representatives of the VWF Group and MDEQ were notified of the start of the five-year review process during a conference call in November 2006. This Five-Year Review report was prepared by U.S. EPA staff. The report was drafted by Richard Boice, who has been U.S. EPA's remedial project manager (RPM) for this Site since 1996. Arunas Draugelis, an U.S. EPA toxicologist, provided input into the risk assessment. Bob Kay, Geologist for the United States Geological Service provided input into the review of the extent of groundwater capture at the Annex and TSRR. Richard Byvek, chemist provided input into review of the TSRR soil data. In addition, the VWF Group, Progressive, and MDEQ provided input and comments on the Five-Year Review.

Community Notification and Involvement: A representative of the City of Battle Creek was notified of the start of the five-year review process during a conference call in November 2006. Other interested parties were given an opportunity to provide input in the review through a notice in the Battle Creek Enquirer on December 4, 2006 (see Attachment 9).

Document Review: Documents used for preparation of this report are listed starting at the end of this report. A screening-level risk assessment was performed by U.S. EPA.

Data Review: See Section V.

Site Inspection: As part of the second five-year review, Richard Boice and Arunas Draugelis of U.S. EPA, and Matthew Baltusis of MDEQ conducted a Site inspection on April 16, 2007. Bridget Morello of Progressive accompanied the inspectors, and at TSRR Shea Muller and Butch Wisman of Earthtech accompanied the inspectors. The Site inspection included observations of the following:

- residences east of TSRR, southeast of the Paint Shop and west of Brigden Ave., and the distances of these residences to the source areas;
- businesses near and down gradient from TSRR and the Annex, and the distances

from these businesses to the source areas;
- fencing, treatment, and pumping facilities at TSRR;
- air sparging facilities at the Paint Shop;
- fencing, air sparging, and pumping and instrumentation facilities at the Annex;
- fencing, treatment, and discharge piping at the VWF treatment facility;
- pumping and instrumentation facilities inside NBW pump house for V26;
- pumping and instrumentation facilities inside the SBW pump house.

Pumping rates and pressures at the time of the inspection were recorded. All the treatment and pumping facilities appeared to be well maintained and operating normally. At TSRR, the total of the pumping rates was 141.5 gpm, which was much improved over the average pumping rate in 2005. EW2 at TSRR was pumping at 34.9 gpm, which was higher than EW2 had been pumped during the previous few years. The air stripper differential pressure was 7.5 inches, which is getting high. Earthtech changed the packing during July 2007.

At the Annex, the total pumping rate of the two deeper pumping wells was 103 gpm, which is 94% of the design rate of 110 gpm. As has been typical, the total pumping rate of the two shallow wells was 6.2 gpm, which is only about 30% of the design rate of 20 gpm. At V26, the pumping rate was 285 gpm, which is 96% of the design rate of 295 gpm. All of the SBWs were operating above their design rates, and the sum of the SBW pumping rates was 2430 gpm, which is about 109% of the design rate of 2235 gpm. After the inspection there was a meeting including representatives of U.S. EPA, MDEQ, the City of Battle Creek, and the VWF Group. Issues discussed included: the vapor intrusion evaluation; TSRR and Davis Oil activities; the IC evaluation; O&M of the Annex and blocking well system; requirements for a request to shut-down pumping at the Annex and NBWs; well abandonment; the VWFMP; and the second five-year review.

Richard Boice also visited TSRR, the Annex and Paint Shop on August 23, 2007. Two openings to the Annex were observed that are big enough for a man to squeeze through. One was where the western fence is not tied into the concrete side of the Emmett Street overpass; and the second is through the gate, which even when locked does not close tightly. U.S. EPA will request that the VWF Group make repairs to eliminate these openings.

Interviews: The RPM routinely discusses Site matters with the VWF Group's Project Manager, Bridget Morello of Progressive, and with MDEQ's site manager, Beth Mead-O'Brien. Meetings or conference calls are held annually during the fall, and include representatives of U.S. EPA, MDEQ, the VWF Group, and the City of Battle Creek. Significant communications among these parties are included in the list at the end of this report (Documents Consulted for this Five-Year Review). The RPM has had the following discussions with other parties:

- Sue Hauxwell, Chief, Calhoun County Private Water Supply to clarify well permit review procedures;
- Sharon Lindauer, Pennfield Township Supervisor about Pennfield Township ordinances restricting installation of new water supply wells;
- Penny Herworth, Manager, Grand Trunk Credit Union for information on the building for the vapor intrusion evaluation; and
- Carrie Rivette, Fleis & Vandenbrink regarding activities on the Davis Oil property.

U.S. EPA has received no communications from other parties or outside groups expressing special interest in this Site. The City of Battle Creek has done a good job of promoting the interests of its citizens and water customers.

VII. Summary of Technical Assessment

A. QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

Protection of the City of Battle Creek Water Supply, and Design and Operation of the NBWs, SBW, and Paint Shop Pump-and-Treat System: The answer is yes. The two-line blocking well system's performance has improved since the enhanced system was constructed and pumping rates were increased in 2004. Water level surveys have demonstrated that the SBWs and NBWs are inducing a backward gradient toward the blocking well lines, and contaminant data also indicate improvements in capture. Although it is uncertain whether operation of BW-9 is fully achieving its design objective of containing groundwater contamination going around the northeast corner of the SBWs in the shallow groundwater, it appears that no further action is justified at this time for the following reasons: it is difficult and expensive to definitively monitor and to design improvements in this location because it involves multiple aquifers and competition between the two blocking well lines; and BW-9 is only about 500 feet from the NBWs. The *Contingency Plan for Enhanced System and Annex Upgrades*, Progressive, 2002, provides a systematic plan for responding to unexpected detections in the NBW sentinel wells. The VWF Group has responded to such detections twice in accordance with the Contingency Plan, and each time the follow-up samples were clean.

Design and Operation for the Annex: The answer is yes. At the Annex installation of two shallow groundwater pumping wells has significantly improved groundwater capture. In spite of frequent well treatments, the pumping rates in the shallow pumping rates have decreased, and since April 2006 have not been maintained much above 5 gpm. At this pumping rate, the water level data collected in July 2006 did not demonstrate an inward gradient at the down gradient end of the Annex. Progressive has attributed the reductions in pumping rates to iron fouling, and lowering of the water table / dewatering of the sand and gravel aquifer. Considering the following factors, it should not be

necessary to take further action to improve pumping rates from the shallow Annex pumping wells:

- groundwater concentrations in the intermediate sandstone pumping wells, and the sentinel wells (MW-2A and MW-2B) have not increased;
- operation of the air sparging system has resulted in a large drop in groundwater concentrations, and, it appears likely that the continued operation of the air sparge system will result in achieving CUOs at the Annex within a few years;
- the VWF Group is doing as much as possible to maintain higher pumping rates from the shallow pumping wells.

Design and Operation for TSRR: The answer is yes, but it can be improved. The pace of cleanup of free product at Davis Oil is complicating and is significantly increasing monitoring and operational expenses for the pump and treat system at TSRR. The presence of Davis Oil's free product may be increasing fouling of TSRR pumping wells, and air stripper, and making it harder for MDEQ to maintain desired pumping rates. Pumping rates during the past three years have generally been less than desired although an adequate capture zone appears to have been maintained except during a couple months in 2005. The low pumping rates have primarily resulted from shut-downs and reductions in pumping to avoid discharge of free product from the Davis Oil property, insufficient treatment / maintenance of the pumping wells and the air stripper, and prolonged periods of shut-down of pumping wells for treatment and maintenance. MDEQ has committed to improving O&M, and recently pumping rates have increased to rates that clearly achieve the target capture zone.

Groundwater Clean-up: The answer is yes. VOC concentrations at the NBWs are continuing to gradually decrease. PCE is the only VOC exceeding its CUO near the NBWs. In November 2006 samples, PCE only slightly exceeded its CUO in one NBW, and in three monitoring wells between the blocking wells. It appears that the area between the blocking well lines could be cleaned up within a few years if BW-9 is effective in cutting off PCE contamination that was migrating around the northeastern end of the SBW line. Available data indicate that it will take many years to clean up the aquifers between the source areas and the SBWs (this is consistent with the expectation from the ROD). The air sparging systems at the Annex and Paint Shop, which are not required in the ROD, have sharply reduced VOC concentrations in the most contaminated groundwater at these source areas.

The pace of groundwater clean-up in groundwater below the TSRR property has been consistent with expectations in the ROD, but data from groundwater below Davis Oil, and unsaturated soil data indicates that it may take a prolonged period of time to achieve the CUOs. Increasing pumping rates, adjustments to the pump-and-treat system, and air sparging of hot spots may shorten the time for achieving the CUOs. MDEQ has recently improved its O&M to increase pumping rates, and installation of EW3R is expected to

enable MDEQ to pump at higher rates without discharging Davis Oil's free product, and to increase the pace of cleanup of Davis Oil's free product.

Source Area Soil Clean-up: The answer is no. The SVE system at TSRR was effective in removing VOCs from the vadose zone soils. However, new data from soil samples collected by MDEQ in May 2005 indicates that SVE was not successful in achieving the soil CUOs, as had been previously believed based on soil sampling conducted in 1992. U.S. EPA and MDEQ are discussing options for addressing this situation.

Preliminary soil sampling results from the Annex indicates that the SVE system was effective in reducing soil VOC concentrations at the Annex and Paint Shop, but it may not have been effective enough to achieve the soil CUOs. It is uncertain whether the air sparging that is being conducted will reduce vadose zone VOC contamination. The U.S. EPA and MDEQ-approved *Final Soil Verification Sampling Plan* is expected to be implemented in 2008 after completion of the air sparging. This sampling will provide sufficient data to evaluate the effectiveness of the SVE treatment, and whether any additional soil remedial measures are necessary.

Compliance with Air and Surface Water Discharge Limitations, and Off-site Disposal Requirements: The answer is yes.

Institutional Controls to Provide Protection to the Public Health until the Cleanup is Completed: The answer is yes, but it can be improved. The existing Consent Decrees, the VWFMP, deed notice, TSRR ownership of TSRR, Calhoun County well permit program, Township ordinances, City and Township zoning and future land use, and IC monitoring appear to provide adequate protection. However, for the Annex and Paint Shop, U.S. EPA plans to evaluate whether the deed notice is effective to bind future owners to property use restrictions, and if necessary propose a restrictive covenant in order to ensure the remedy's long-term protectiveness.

B. QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES USED AT THE TIME OF THE REMEDY STILL VALID?

The answer is yes, except for use of average hot spot concentrations to screen out dieldrin and benzo(a)pyrene from the final soil sampling at the Annex.

Consideration of Additive Risks: There may be concern that the additive effects of being exposed to multiple contaminants may result in the remedy not being protective. However, experience has shown that as VOCs are cleaned up in the groundwater and soil, eventually only one or two contaminants remain that present a significant risk. This is demonstrated by the recent groundwater and soil data, which indicates the following:

- only PCE exceeded groundwater CUOs in the northern blocking well vicinity;
- only PCE exceeded groundwater CUOs by more than a factor of 10 at the Annex and Paint Shop;
- only PCE and TCE exceeded groundwater CUOs by more than a factor of 10 at TSRR; and
- only PCE and TCE exceeded soil CUOs at TSRR.

Therefore, it is protective to establish the CUOs without adjustment to address additive risk for exposure to multiple contaminants.

Evaluation of Whether CUOs are Protective Considering Updated Risk Evaluation Procedures and Toxicity Factors: To evaluate whether the ESD CUOs are protective for each contaminant, the MCLs, Michigan criteria, and risk goals used to develop the ESD CUOS are compared to the current MCLs, current Michigan criteria, and current calculation procedures and toxicity factors used to develop risk goals. Any MCLs, Michigan criteria, or risk goals that are currently significantly more stringent are investigated further to determine whether updating the CUO is necessary. Because of the uncertainty in risk estimates, differences in risk estimates can be considered insignificant if they are at less than ½ orders of magnitude different. The change must result in a risk based criteria less than 0.3 X the risk based criteria in the 2003 ESD.[8]

None of the MCLs have changed from the MCLs used in the 2003 ESD. The MDEQ criteria in the 2003 ESD (from June 7, 2000) were compared to the current MDEQ criteria (from January 23, 2006). The only current Michigan criteria that are more stringent are both for chloroform:

- the residential drinking water criteria decreased from 100 to 80 ug/l;'
- the soil drinking water protection criteria decreased from 2,000 to 1,600 ug/kg.

However, updating the CUO for chloroform is not necessary because the updated Michigan criteria for chloroform are not significantly more stringent than the ESD criteria, and because review of recent data indicates that chloroform no longer presents a significant risk in either groundwater or soil.

The 2003 ESD used risk goals calculated by Progressive, with U.S. EPA oversight, in accordance with Part A and Part B of U.S. EPA's *Risk Assessment Guidance for Superfund* (see letter from Progressive dated November 5, 2002). The algorithms and standard default exposure factors from the Part B guidance (December 1991) were used. These calculation procedures and standard default exposure factors are still used

[8] See Section 2.4 of a memorandum dated October 1, 2002 from Stanford J. Smucker, Ph.D, Region IX, EPA regarding Region 9 PRGs Table, 2002 update.

by and are considered valid by U.S. EPA. The toxicity factors used were from the 9/27/2001 update of the U.S. EPA Region 9 PRG tables, except for the following:

- oral and inhalation reference doses for chloroform were from the 10/19/01 update in U.S. EPA's *Integrated Risk Information System* (IRIS);
- oral and inhalation references doses for 1,1-dichloroethylene were from the 8/13/2002 update in IRIS; and
- oral and inhalation slope factors for PCE were from OSWER No. 8285.7-75, June 12, 2003.

Review of IRIS indicates that only the toxicity factors for the following contaminants of concern have been updated since the 2003 ESD: acetone; benzene; toluene; and xylene. Of these contaminants, only the reference dose for xylene have become more stringent (ESD oral reference dose = 2 mg/kg-d, compared to 0.2 in the 2/21/2003 update in IRIS). However, the ESD CUO was based on the more stringent Michigan criteria (280 ug/l) instead of the risk goal (1,896 ug/l). For that reason, updating the ESD risk goal would not result in a more stringent CUO.

For derivation of the soil CUOs, besides the Michigan criteria, 20 times the groundwater CUO was used. Although more sophisticated modeling could be used, this procedure is conservative and will be protective of the groundwater for drinking water usage.

Consideration of SVOCs, and metals in groundwater: To assure that the decision to eliminate future sampling of SVOCs and metals in groundwater (other than arsenic at the Annex, and aluminum, iron and sodium at the Paint Shop) will be protective, the SVOC and metal data in the *Source Area Ground Water Metals and SVOCs Assessment Summary Report* (Progressive, May 23, 2003) was reviewed, and compared to the 2004 PRGs for tap water and background concentrations in the following table (concentrations are in ug/l):

TABLE 15: EVALUATION OF CERTAIN SVOCS AND METALS IN GROUNDWATER (detections exceeding both the PRG and MCL are bolded)

Source Area	Contaminant	Range of Detections	PRG / MCL	Background
Annex	Bis(2-ethylhexyl)phthalate	0.35J - 0.59J	4.8	NA
	Arsenic	6.2 - **350**	0.045 / 10	15
	Manganese	101- 560	880	1,127
	Vanadium	≤2 - 7.6B	36	34
	Zinc	≤97 - 920	11,000	1,202

Source Area	Contaminant	Range of Detections	PRG / MCL	Background
Paint Shop	Bis(2-ethylhexyl)phthalate	0.37J - 3.9J	4.8	NA
	Aluminum	≤50 - 21,200	None	1,549
	Arsenic	≤5 - **28**	0.045 / 10	7.2
	Iron	610 - **129,000**	11,000	8,357
	Lead	1.8 - **76**	None / 15	47
	Manganese	20 - 194	880	2,018
	Sodium	≤500 - 240,000	None	122,544
	Vanadium	1 - 24	36	34
	Zinc	14 - 1200	11,000	5,281
TSRR	Bis(2-ethylhexyl)phthalate	≤2 - 5	4.8	NA
	Arsenic	≤1 - 3.8	0.045 / 10	15
	Cadmium	≤0.2 - 0.7	18 / 5	0.3
	Chromium	≤1 - 8.2	110 / 100	30
	Lead	≤1 - 15	None/ 15	18
	Manganese	≤5 - **1,160**	880	1,127
	Nickel	4.5 - 10	730	30
	Zinc	≤10 - 3,070	11,000	1,202

Detections exceeding the higher of the PRG or MCL, and the background concentration are bolded. This table raises the question of whether it was protective to eliminate further sampling for arsenic and lead at the Paint Shop, and for manganese at TSRR. This decision was protective for the reasons explained below:

- Arsenic was detected in three of the six samples analyzed for arsenic in Paint Shop groundwater samples, at concentrations of 28, 7.1, and 11 ug/l. However, these detections were in groundwater samples from pilot borings, and were not well developed as thoroughly as monitoring wells. Arsenic was not detected in samples from two nearby monitoring wells; and so the arsenic detections are likely to have been associated with aquifer solids in the samples.
- Only one of the twelve samples analyzed for lead in Paint Shop groundwater samples exceeded background. This sample was from CH-146I, but three other samples from that well had lower turbidity and were less than background. For

that reason, the elevated lead in the single sample from CH-146I is probably caused by relatively high aquifer solids in the sample.
- Only one of the 24 samples analyzed for manganese in TSRR groundwater samples exceeded background, and the amount is not significantly greater than background.

Based on this data in the 2003 ESD, U.S. EPA identified arsenic as a contaminant of known concern in Annex groundwater, required inclusion of arsenic in the long-term groundwater monitoring at the Annex, and added a CUO for arsenic (15 ug/l based on the background concentration). U.S. EPA identified aluminum, iron and sodium as potential contaminants of concern in Paint Shop groundwater, required further monitoring for these potential contaminants in Paint Shop groundwater, but included no CUOs for them.

MDEQ believed that the ESD should have added CUOs for aluminum, iron and sodium because they exceeded State of Michigan Part 201 groundwater criteria for residential usage protection in Paint Shop groundwater. In the 2003 ESD, U.S. EPA explained that aluminum, iron and sodium are different from the Contaminants of Known Concern for a number of reasons:

- they are normal constituents of groundwater;
- they are necessary human nutrients;
- their toxic effects are produced only at high doses;
- groundwater problems from iron and sodium are often caused by area-wide conditions, such as naturally high dissolved iron, salt water intrusion in coastal areas, or impacts from use of road salt;
- aluminum and iron are major components of aquifer solids, and, as a result, elevated detections of aluminum and iron in groundwater are often from aquifer solids suspended in the groundwater sample;
- aluminum, iron and sodium salts are not hazardous substances, and it is unlikely that the presence of these metals in groundwater at the Paint Shop resulted from a release of a hazardous substance.
- the areas of high concentration of these metals at the Paint Shop do not appear to be associated with disposal in the former drum pit.

The sampling results for iron, aluminum and sodium in groundwater at the Paint Shop indicates that there was a variation of concentrations, and there is a diversity of opinion regarding the toxicity of these metals. For aluminum, there was only one detection of aluminum from a Paint Shop monitoring well that exceeded MDEQ's criteria (4,200 ug/l in W13), but this detection is well below the Region 9 PRG. It is possible that the elevated aluminum from W13 was actually from suspended solids in the sample. For iron, 9 of the 13 Paint Shop samples exceeded MDEQ's criteria and background for iron, and 6 of the 13 samples exceeded the PRG. However, there was a wide variation in

where multiple samples were collected from the same monitoring well: 610 to 32,800 ug/l in CH140; 220 to 72,900 ug/l in CH145; and 8,500 to 12,000 ug/l in CH146. For each of these monitoring wells, the iron concentrations ranged from less than the PRG to much more than the PRG. This suggests that the differences in iron concentrations were caused by variations in the amount of solids in the samples rather than due to actual variations in iron concentrations in groundwater.

For sodium, 6 of the 13 samples exceeded MDEQ's criteria and background. Unlike iron, the results of multiple samples from the same well were reasonably consistent, but there were large variations among wells. W13 and CH146I are both close down gradient wells from the former drum pit and have similar VOC concentrations, but sodium was less than 500 ug/l in W13, but was detected at 190,000 to 240,000 ug/l in CH146I. This suggests that the drum pit was not the source of the sodium. A PRG has not been developed for sodium.

The sampling conducted for aluminum, iron and sodium in Paint Shop groundwater during 2004 to 2005, indicated that the groundwater detections of these potential contaminants in Paint Shop groundwater did not indicate a risk to drinking water, and, for that reason, sampling for these contaminants was discontinued in 2006.

Consideration of Metals, SVOCs, Pesticides, PCBs in soil: To assure that the decision to eliminate future sampling for SVOCs, pesticides, PCBs, and metals in soil will be protective, a screening level risk assessment was conducted by comparing the soil detections from the March 2002 TSRR soil sampling, and the December 2002 Annex and Paint Shop soil sampling to the 2004 PRGs for residential soil direct contact, industrial direct contact, and SSLs. The results were the same as the previous risk screening except that the Annex and Paint Shop data was compared to the PRG for residential direct contact in addition to the PRG for industrial soil direct contact. None of the data for TSRR or the Paint Shop exceeded the 2004 residential soil PRGs or SSLs except for arsenic, which was at background concentrations.

A number of detections at the nine Annex soil samples exceeded the 2004 PRG / SSLs (see Table 16). The PRGs are for screening for direct contact risks while the SSLs are for screening risks to groundwater. For calculation of average concentrations for SVOCs, half of the lowest detection of benzo(a)pyrene was used (½ X 9 = 5 ug/kg); for dieldrin half the detection limit was used (18 ug/kg).

TABLE 16: EVALUATION OF SVOCS, METALS, PESTICIDES AND PCBS DETECTED IN DECEMBER 2002 SAMPLING OF ANNEX SOILS (concentrations are in ug/kg)

Contaminant	Number Detects	Range	Ave.	PRG Res.	PRG Ind.	MDEQ Res.	SSL
Arsenic	9	1,100 - 6,000	3,000	390	1,600	7,600	29,000
Benzo(a) Anthracene	4	24 - 830	120	620	2,100	20,000	2,000
Benzo(a)pyrene	3	9 - 420	60	62	210	2,000	8,000
Benzo(b) fluoranthene	4	44 - 740	130	620	2,100	20,000	5,000
3,3'-dichloro-benzidene	1	24	7	1,100	3,800	6,600	7
Dieldrin	6	5.4 - 560	100	30	110	1,100	4
N-nitroso-di-n-propylamine	1	740	90	69	250	1,200	0.05
1,1,2,2-TCA	1	670	74	410	930	53,000	3

As previously mentioned, the SSLs for 3,3'-dichlorobenzidene, dieldrin, n-nitros-di-n-propylamine, and 1,1,2,2-TCA were exceeded. This indicates a potential risk to groundwater, which was addressed by additional groundwater sampling.

As was the case at TSRR and the Paint Shop, arsenic exceeded the PRGs, but is actually at background concentrations. N-nitroso-di-n-propylamine was only detected in one sample that was 12 to 16 feet below ground surface, and is an unstable compound that is unlikely to persist in the environment. For these reasons, the direct contact risk from n-nitroso-di-n-propylamine is screened out for residential usage. Some samples had exceeded the residential soil PRGs for benzo(a)anthracene, benzo(b)fluoranthene, and 1,1,2,2-TCA, by minor amounts in a limited number of samples. Considering that the PRGs are conservative, and that the concentrations exceeded the PRGs by only a small amount in a limited number of samples, it was protective to screen out from further soil sampling for these compounds.

Dieldrin was also detected in six of the nine samples, at concentrations of 5.4, 39, 44, 74, 79, and 560. The single detection at 560 ug/kg exceeds both the residential soil PRG and Industrial soil PRG. Benzo(a)pyrene was detected in three of the nine samples, at concentrations of 9, 53, and 420 ug/kg. The single detection at 420 ug/kg exceeds both the residential soil PRG and industrial soil PRG. On the other hand, all of

the samples were less than MDEQ's residential soil direct contact criteria, and were less than the industrial soil PRG adjusted to the 1 X 10^{-5} risk level. One reason for the difference between the PRGs and the MDEQ criteria, is that the PRGs are calculated using a calculated incremental lifetime cancer risk of 1 X 10^{-6}, while the MDEQ uses 1 X 10^{-5}. Only dieldrin exceeds the residential soil PRG adjusted to a 1 X 10^{-5} risk level, and that by a fairly minor amount.

Previously, U.S. EPA had concluded that the data was sufficient to screen out further sampling for benzo(a)pyrene and dieldrin with the following reasoning:

- risks from direct contact with soil are generally related to the average soil concentration;
- average concentrations for these contaminants were all less than the industrial soil PRGs;
- use of the average concentration is conservative in this situation because the samples were collected at hot spots;
- the VWF Group had agreed to impose permanent restrictions on usage of the Annex property for residential purposes.

However, U.S. EPA's risk assessor has recommended against using averages for screening risks. In this case, using the residential or industrial PRGs, dieldrin and benzo(a)pyrene, are not screened out from the final soil sampling. In response to this, U.S. EPA needs to take one of the following actions: require that dieldrin and benzo(a)pyrene be included in the final soil sampling; change the Selected Remedy to adjust the soil CUOs for the Annex; or change the selected remedy to require a permanent restrictions on usage of the Annex property.

C. QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

The answer is no, to our knowledge all significant information that is presently available has been addressed in this five-year review.

VIII. Issues

TABLE 17: ISSUES IDENTIFIED FROM SECOND FIVE-YEAR REVIEW

Issue(s)	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. At TSRR, free product in groundwater below an adjacent facility is complicating and increasing the costs for operating the pump and treat system.	N	N
2. At TSRR, additional soil sampling identified that the soil cleanup objectives had not been achieved.	N	Y
3. For the Annex, a data evaluation method (hot spot soil concentrations were averaged) was used to screen out future soil sampling for dieldrin and benzo(a)pyrene.	N	Y
4. For the Annex and Paint Shop, it is unclear whether the deed notice binds future owners to existing restrictions.	N	Y
5. Businesses and property owners located adjacent to source areas or near the groundwater plume have not been notified that vapor intrusion, if it occurs, could cause a risk if property is used for residential purposes.	N	Y

IX. Recommendations and Follow-up Actions

TABLE 18: RECOMMENDATIONS AND FOLLOW UP ACTIONS FROM SECOND FIVE-YEAR REVIEW

Issue	Recommendation and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness current	future
1	For TSRR, install and operate a pumping well and free product recovery system to increase the rate of cleanup of the free product and prevent it from discharging through the pump-and-treat system, and investigate use of other technologies to cleanup the free product	MDEQ / Davis Oil	U.S. EPA	9/30/2008	N	N

Issue	Recommendation and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness current	future
2	For TSRR, evaluate options for further soil treatment.	U.S. EPA / MDEQ	U.S. EPA / MDEQ	9/30/2008	N	Y
3	For Annex, add dieldrin and benzo(a)pyrene to the final soil sampling; change the Selected Remedy to adjust the soil CUOs; or change the Selected Remedy to require permanent usage restrictions.	VWF Group / U.S. EPA	U.S. EPA	9/30/2008	N	Y
4	For the Annex and Paint Shop, evaluate whether the deed notice is effective to bind future owners to property use restrictions, and if necessary propose a restrictive covenant in order to ensure the remedy's long-term protectiveness	VWF Group	U.S. EPA	9/30/2008	N	Y
5	Notify nearby businesses and property owners of the potential for vapor intrusion.	VWF Group, U.S. EPA	U.S. EPA	12/30/2007	N	Y

X. Protectiveness Statement

The Verona Well Field Site is divided into two operable units. Operable unit 1 is associated with cleaning up source area soil and groundwater at TSRR. Operable unit 2 is associated with remedial actions to protect the City water supply, to cleanup the aquifer, and to cleanup source area soil and groundwater at the Annex and the Paint Shop. The following protectiveness statement applies to both operable units and to the Site as a whole. The selected remedy is considered protective in the short term; however, in order to assure that it is protective in the long-term, follow up actions need to be implemented, including:

- At the TSRR source area, evaluate further treatment options for soil;
- At the Annex source area, adding dieldrin and benzo(a)pyrene to the final soil sampling; changing the selected remedy to adjust the soil clean up objectives; or changing the selected remedy to require permanent usage restrictions;
- At the Annex and Paint Shop source area, evaluating whether the deed notice is effective to bind future owners to property use restrictions, and if necessary proposing a restrictive covenant in order to ensure the remedy's long-term protectiveness; and
- Notifying nearby businesses and property owners of the potential for vapor intrusion.

XI. Next Five-Year Review

The next five-year review should be conducted within five years after the signature date of this review.

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TABLE 19:

2003 ESD TABLE 1: VERONA WELL FIELD, BATTLE CREEK, MICHIGAN IDENTIFICATION OF CONTAMINANTS OF KNOWN CONCERN FOR SOIL AND GROUNDWATER (GW) MONITORING; IDENTIFICATION OF POTENTIAL CONTAMINANTS OF CONCERN FOR SOURCE AREA GW MONITORING (the relevant source area or areas are identified in parenthesis following the name of the contaminant); IDENTIFICATION AND DERIVATION OF UPDATED GW CUOs, WHICH ARE ALSO THE SOIL CUOs if SPLP LEACHING TEST RESULTS ARE AVAILABLE (by comparing the leachate concentration with the GW CUOs); AND SOIL CUOs FOR TOTAL VOC ANALYSES (which are applicable if SPLP tests are not run)

(Units are in micrograms/liter for ground water and soil leachate, and micrograms per kilogram for soil)

VOC GW AND Soil Contaminants of Known Concern	1991 ROD GWCUO	TDL[i]/ BKG R	GW Cancer Risk Goal[ii]	GW Non-Cancer Risk Goal[2]	MCL[iii]	Michigan GW Criteria[iv]	GW and Soil SPLP CUO[v]
Acetone	700	100	--	768	--	730	730
Benzene	1	1	0.54	14	5	5	1
Carbon tetrachloride	0.3	1	0.26	5	5	5	1
Chlorobenzene	100	1	--	135	100	100	100
Chloroform	6	1	77	77	100	100	77
1,1-Dichloroethane (1,1-DCA)	1	1	--	1008	--	880	880
1,2-Dichloroethane	1	1	0.2	13	5	5	1
1,1-Dichloroethylene	1	1	-	425	7	7	7
cis-1,2-Dichloroethylene (Cis)	1	1	-	77	70	70	70
trans-1,2-Dichloroethylene	100	1	-	154	100	100	100
Ethylbenzene	70	1	--	1,592	700	74	74
Methylene Chloride	5	5	6.2	1,735	5	5	5
Tetrachloroethylene or Perchloroethylene (PCE)	1	1	0.86	275	5	5	1
Toluene	800	1	--	934	1,000	790	790
1,1,1-Trichloroethane	200	1	--	578	200	200	200
1,1,2-Trichloroethane	1	1	0.32	31	5	5	1
Trichloroethylene (TCE)	3	1	2.5	46	5	5	2.5
Vinyl Chloride (VC)	1	1	0.1	79	2	2	1
Xylene (total)	300	3	--	1,896	10,000	280	280

Non-VOC GW Contaminants of Known Concern in Source Area	1991 ROD GWCUO	TDL/ BKG R	GW Cancer Risk Goal	GW Non-Cancer Risk Goal	MCL	Michigan GW Criteria	GW and Soil SPLP CUO
Arsenic (Annex only)	0.02	15	0.015	10.95	10	50	15
GW Contaminants of Potential Concern in Source Areas							
Aluminum (Paint Shop only)	NONE	1,549	--	36,000	--	1,549[vi]	Not Established
Iron (Paint shop only)	NONE	8,357	--	11,000	--	8,357[6]	Not Established
Sodium (Paint Shop only)	NONE	122,544	--	--	--	122,544[6]	Not Established
Dieldrin (Annex only)	NONE	0.02	0.0042	-	-	0.11	Not Established
1,1,2,2-Tetrachloroethane (Annex only)	NONE	1	0.055	-	-	8.5	Not Established

Soil VOC Contaminants of Known Concern	1991 ROD CUO for Total VOCs in Soil	TDL for soil analysis[1]	20 X GW CUO for Protection of Groundwater[vii]	Michigan Soil Drinking Water Protection Criteria[viii]	Soil CUO Total VOCs
Acetone	14,000	100	14,600	15,000	14,600
Benzene	20	10	20	100	20
Carbon Tetrachloride	10	10	20	100	20
Chlorobenzene	2,000	10	2,000	2,000	2,000
Chloroform	100	10	1,540	2,000	1,540
1,1-Dichloroethane	20	10	17,600	18,000	17,600
1,2-Dichloroethane	10	10	20	100	20
1,1-Dichloroethylene	10	10	140	140	140
cis-1,2-Dichloroethylene	20	10	1,400	1,400	1,400
trans-1,2-	2,000	10	2,000	2,000	2,000

Dichloroethylene					
Soil VOC Contaminants of Known Concern	**1991 ROD CUO for Total VOCs in Soil**	**TDL for soil analysis[1]**	**20 X GW CUO for Protection of Groundwater[ix]**	**Michigan Soil Drinking Water Protection Criteria[x]**	**Soil CUO Total VOCs**
Ethylbenzene	1,400	10	1,480	1,500	1,480
Methylene Chloride	100	10	100	100	100
Perchloroethylene	10	10	20	100	20
Toluene	16,000	10	15,800	16,000	15,800
1,1,1-Trichloroethane	4,000	10	4,000	4,000	4,000
1,1,2-Trichloroethane	10	10	20	100	20
Trichloroethylene	60	10	50	100	50
Vinyl Chloride	0.4	10	20	40	20
Xylenes (total)	6,000	30	5,600	5,600	5,600

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i. The CUO defaults to the number in this column if it exceeds the lowest of the risk goals and ARARs. For organic compounds, this column lists the target detection limits (TDLs) from Environmental Response Division Operational Memorandum #6, Revision 5, Analytical Method Detection Level Guidance for Environmental contamination Response Activities under Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act", MDEQ, November 16, 1998. For arsenic, aluminum, iron and sodium, this column lists the background groundwater concentrations for the relevant source area determined in Statistical Analysis of VWF Metals Background Data, Progressive, March 6, 2003 (Table 3), because background exceeded the TDLs

ii. The Cancer Risk Goals correspond to the 1 X 10^{-6} carcinogenic risk level for lifetime exposure via ingestion and inhalation of the contaminant resulting from residential water usage. Dashed lines mean that the parameter is not considered to be carcinogenic. The Non-Cancer Risk Goals are concentrations in water that would result in an exposure rate equal to the reference dose for health effects other than cancer due to ingestion and inhalation of the contaminant from residential water usage. The calculation procedures and toxicity factors are provided in a letter from Progressive Engineering and Construction, Inc. dated November 5, 2002 except that the oral and inhalation slope factors for tetrachloroethylene were updated as provided for in OSWER No. 8285.7-75, dated June 12, 2003.

iii. Safe Drinking Water Act Maximum Contaminant Levels. Dashed lines indicate that no MCL has been established for the parameter.

iv. Generic criteria for residential and commercial I drinking water from "Environmental Response

Division Operational Memorandum #18, Part 201 Generic Cleanup Criteria Tables, Revision 1", MDEQ, June 7, 2000.

v. This column identifies the CUOs for the groundwater cleanup, and also, if leach test results are available, for soil cleanup by comparing the concentrations in the leachate to the GW CUOs (see Section V.C).

vi. The criteria for aluminum, iron and sodium are set equal to background concentrations, in accordance with MDEQ's Operational Memorandum #18..

vii. The 20 X GW CUO for protection of groundwater is the concentration in soil that would result in a concentration in the aqueous phase from an SPLP or TCLP test equal to the groundwater CUOs, assuming that all of the VOCs in the soil leach into the liquid phase. In the SPLP and TCLP tests, the solid phase is leached with an amount of aqueous solution equal to twenty times the weight of the soil sample.

viii. Generic criteria for drinking water protection for Soil: Residential and Commercial I from "Environmental Response Division Operational Memorandum #18, Part 201 Generic Cleanup Criteria Tables, Revision 1", MDEQ, June 7, 2000.

ix. The 20 X GW CUO for protection of groundwater is the concentration in soil that would result in a concentration in the aqueous phase from an SPLP or TCLP test equal to the groundwater CUOs, assuming that all of the VOCs in the soil leach into the liquid phase. In the SPLP and TCLP tests, the solid phase is leached with an amount of aqueous solution equal to twenty times the weight of the soil sample.

x. Generic criteria for drinking water protection for Soil: Residential and Commercial I from "Environmental Response Division Operational Memorandum #18, Part 201 Generic Cleanup Criteria Tables, Revision 1", MDEQ, June 7, 2000.

Site Location

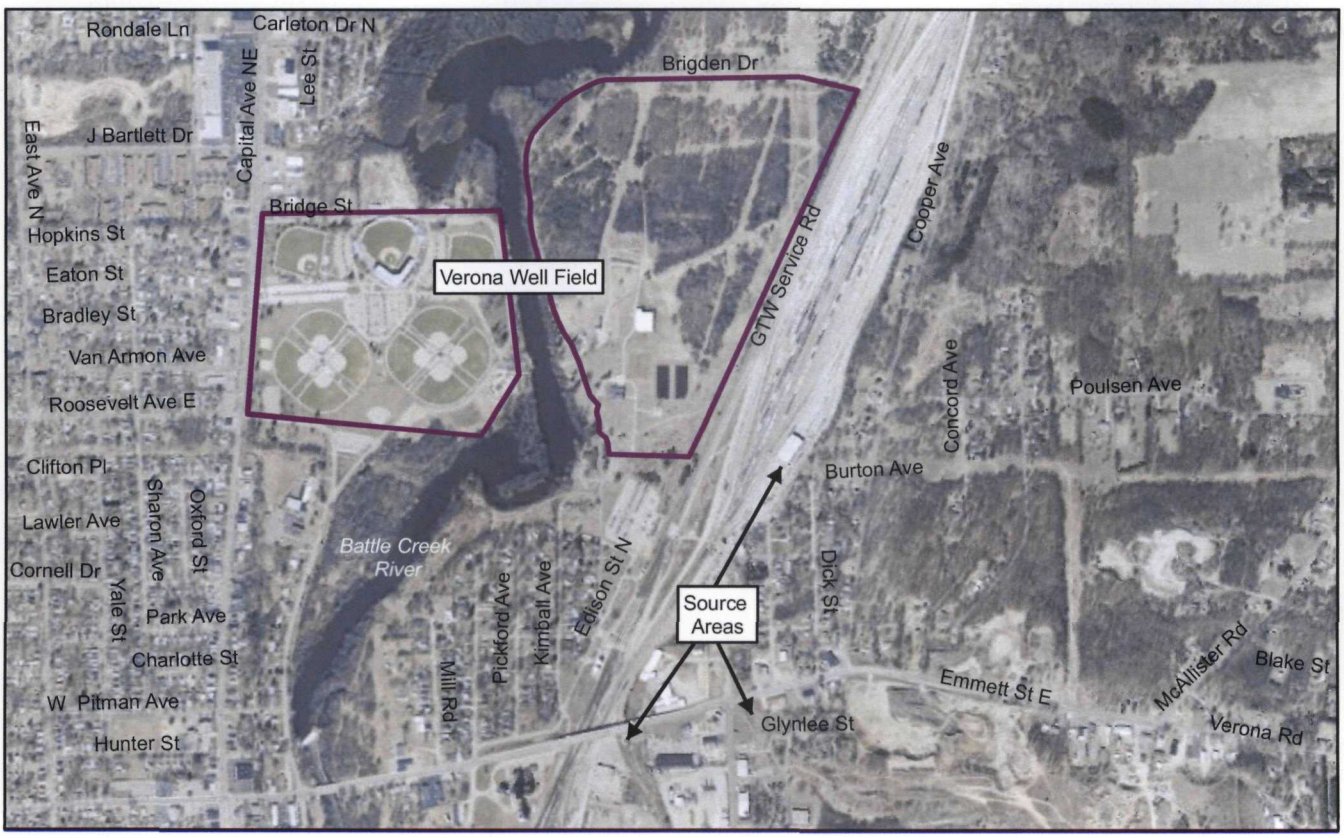
Superfund
U.S. Environmental Protection Agency

Verona Well Field
Calhoun County, MI

MID980793806

State

County



Site

Figure 1

Produced by Sarah Backhouse
U.S. EPA Region 5 on 5/11/07
Image Date: 2006

N

GEOS
Groundwater Evaluation and Optimization System

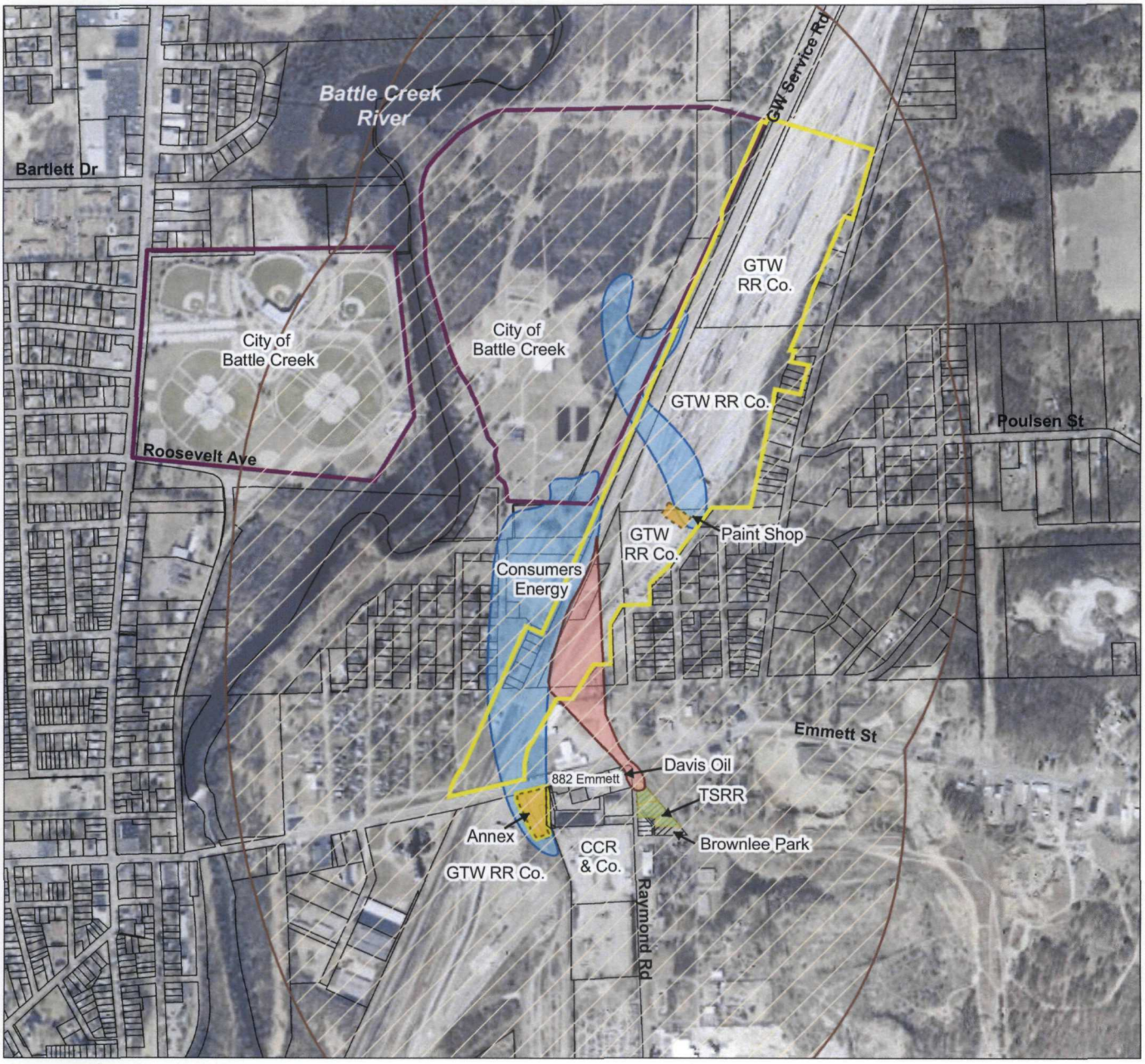
Institutional Control (IC) Review

Areas Depicting Required and Implemented Institutional Controls

Superfund
U.S. Environmental Protection Agency

Verona Well Field
Calhoun County, MI

MID980793806



Legend

- Verona Well Field Boundary
- Parcel Boundaries
- Marshalling Yard
- Annex
- Thomas Solvent Raymond Road
- TSRR VOC Plume - Required IC
- Annex/Paint Shop VOC Plume - Required IC
- Restricted Soil Areas - Required IC
- Government Review Area (0.5 miles) - Implemented IC

0 750 1,500 Feet

N

GEOS Groundwater Evaluation and Optimization System

EPA Disclaimer: Please be advised that areas depicted in the map have been estimated. The map does not create any rights enforceable by any party. EPA may refine or change this data and map at any time.

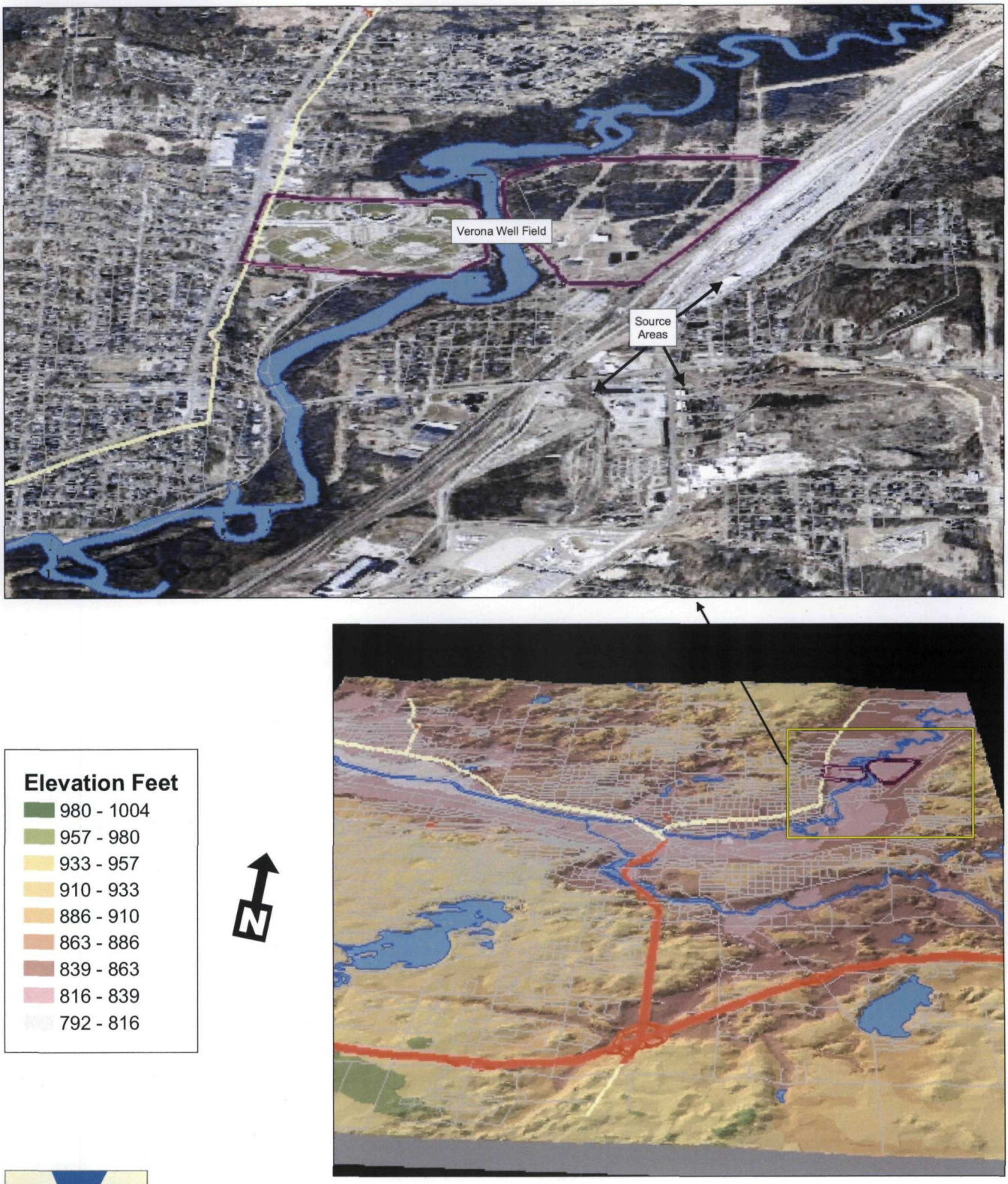
Produced by
Julie Schilf and Sarah Backhouse
U.S. EPA Region 5 on 6/5/07
Image Date: 2006

3D Surface Terrain Model

Superfund
U.S. Environmental Protection Agency

Verona Well Field
Calhoun County, MI

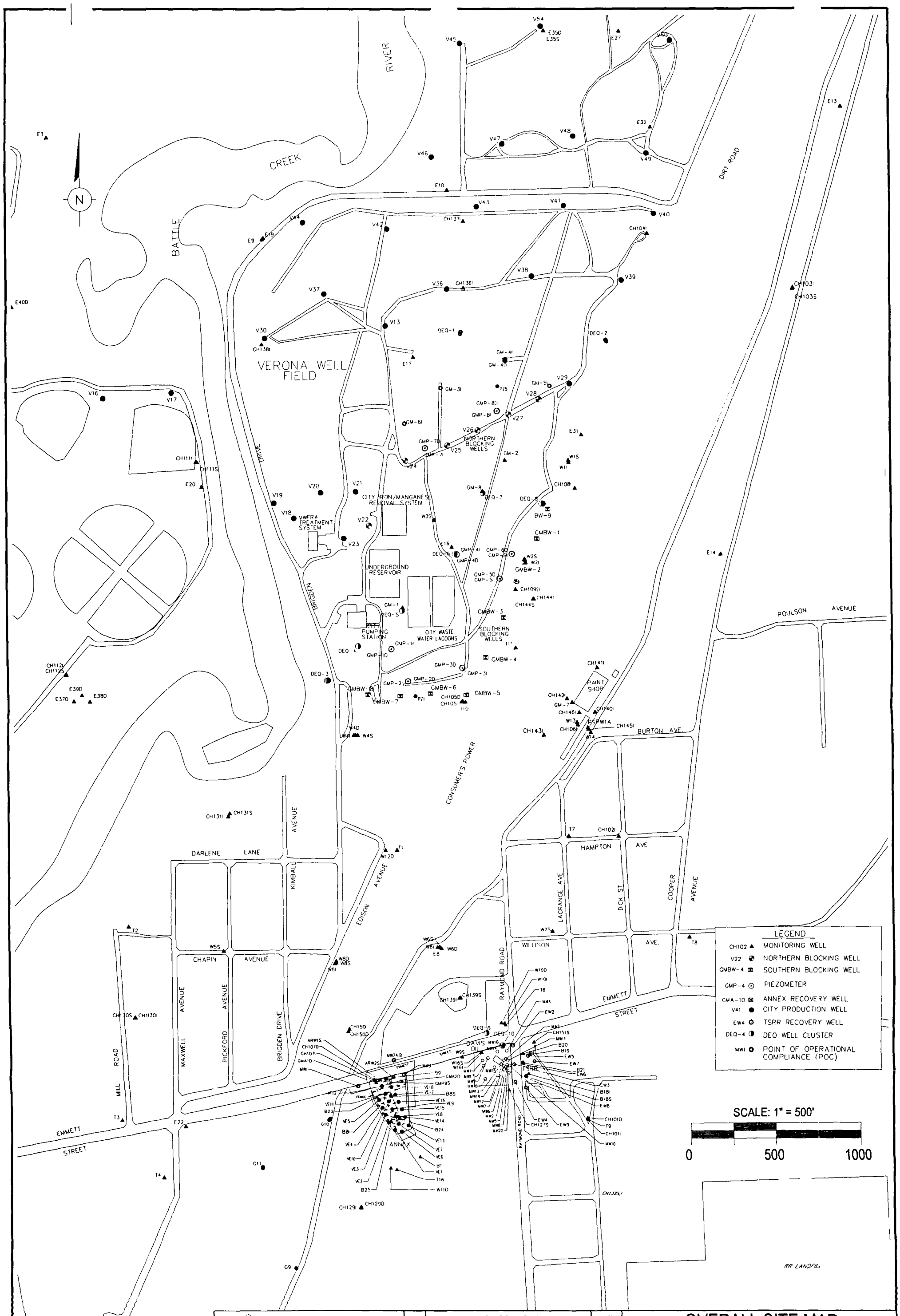
MID980793806



GEOS
Groundwater Evaluation and Optimization System

Figure 2

Produced by Sarah Backhouse
U.S. EPA Region 5 on 5/11/07



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E-mail: info@progressiveec.com
Web Site: http://www.progressiveec.com

NO	REVISION DETAILS	DATE

OVERALL SITE MAP

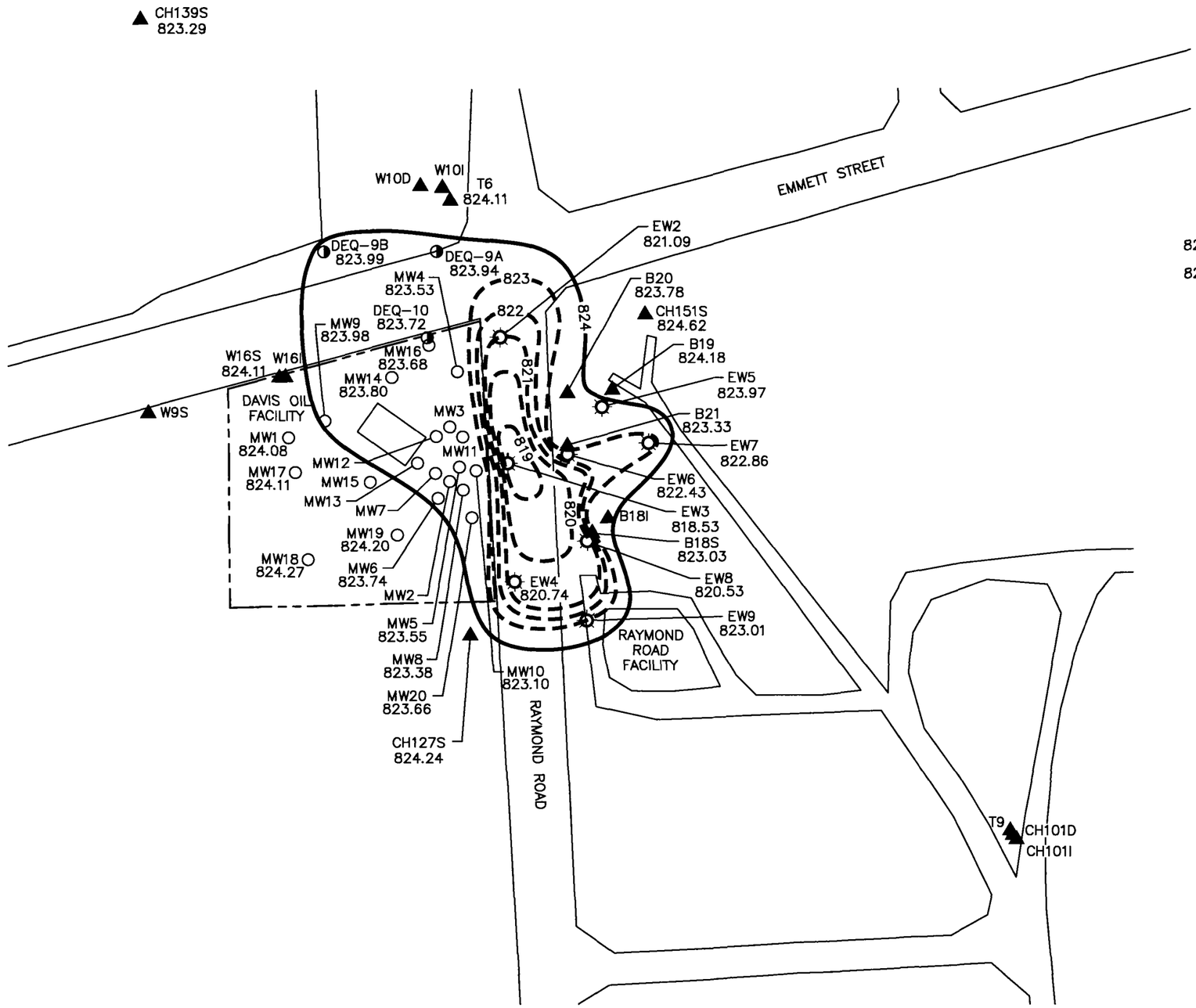
VERONA WELL FIELD
BATTLE CREEK, MICHIGAN

DATE: 1/31/07
DRAWN: MPG
APPROVED: BSM

FIGURE: 1
SHEET 1 OF 15

FILE PATH PROJECTS\VERONA\Drawings\Base\Basemap_010606.dwg
SCALE: 1" = 500'

ATTACHMENT 4



LEGEND

- EXTRACTION WELL
- MONITORING WELL
- DAVIS OIL MONITORING WELL
- 824 GROUNDWATER ELEVATION CONTOUR
- 822 ESTIMATED GROUNDWATER ELEVATION CONTOUR
- 823.97 GROUNDWATER ELEVATION (FEET MSL)

NOTE

FLEIS AND VANDERBRINK COLLECTED WATER LEVELS FOR THE DAVIS OIL WELLS ON JULY 24, 2006.

NORTH

0 100 200

FEET

NOTE: BASE MAP FROM PROGRESSIVE ENGINEERING.

EarthTech

A tyco International Ltd. Company

5555 Glenwood Hills Parkway, SE • P.O. Box 874 • Grand Rapids, MI 49588-0874 • (616) 942-9800

DRAWN BY: NLW	DATE: MARCH 2007
CHECKED BY: KA	EDITED BY: NLW052307
FILE NAME: 34815-JUL06-GW.DWG	

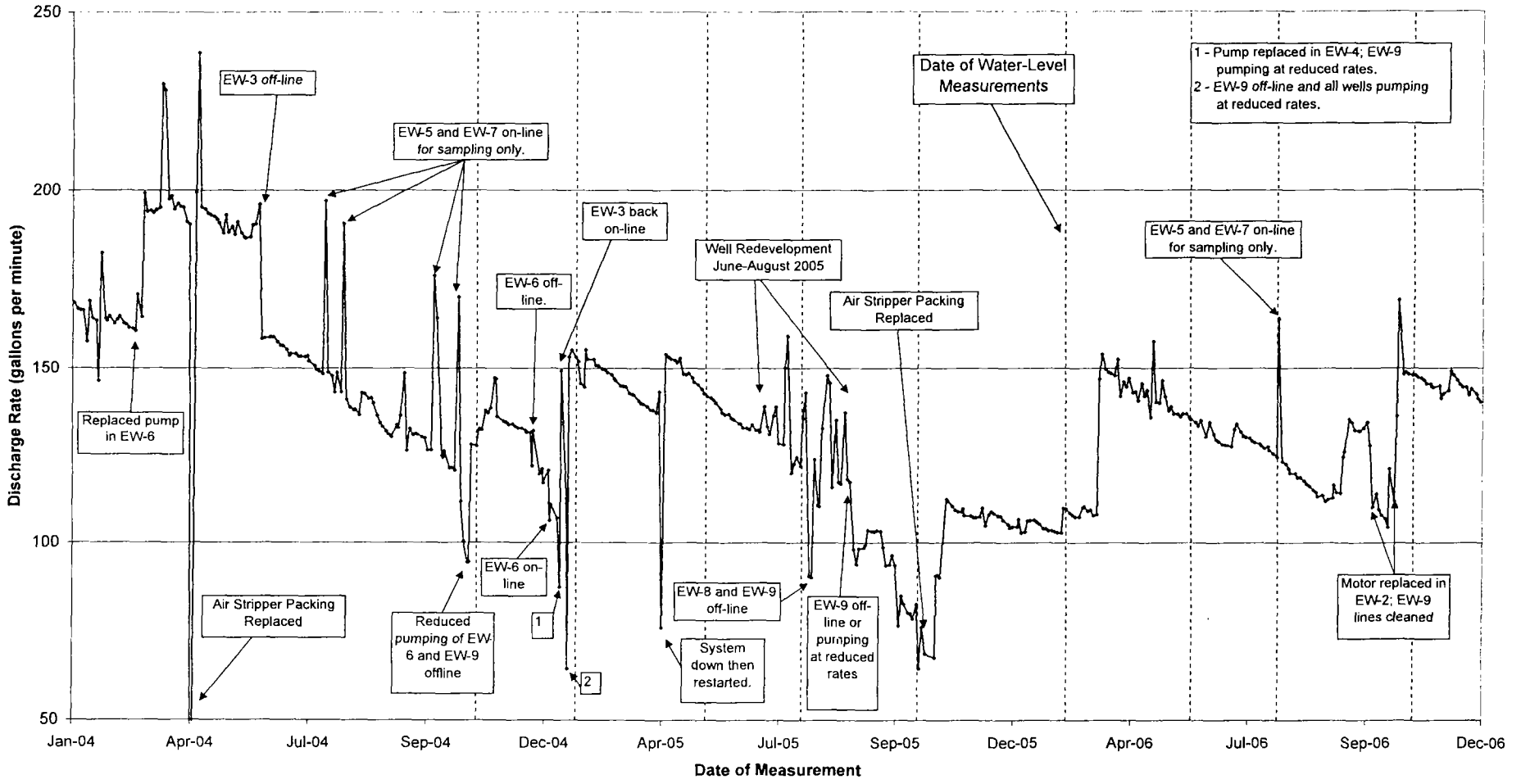
FIGURE 3

GROUNDWATER ELEVATIONS JULY 24, 2006

MDEQ TSRR
BATTLE CREEK, MICHIGAN

PROJECT NUMBER 34815	SCALE: 1" = 100'

Verona TSRR - 2004-2006 Extraction Well Flow Rates - System Total

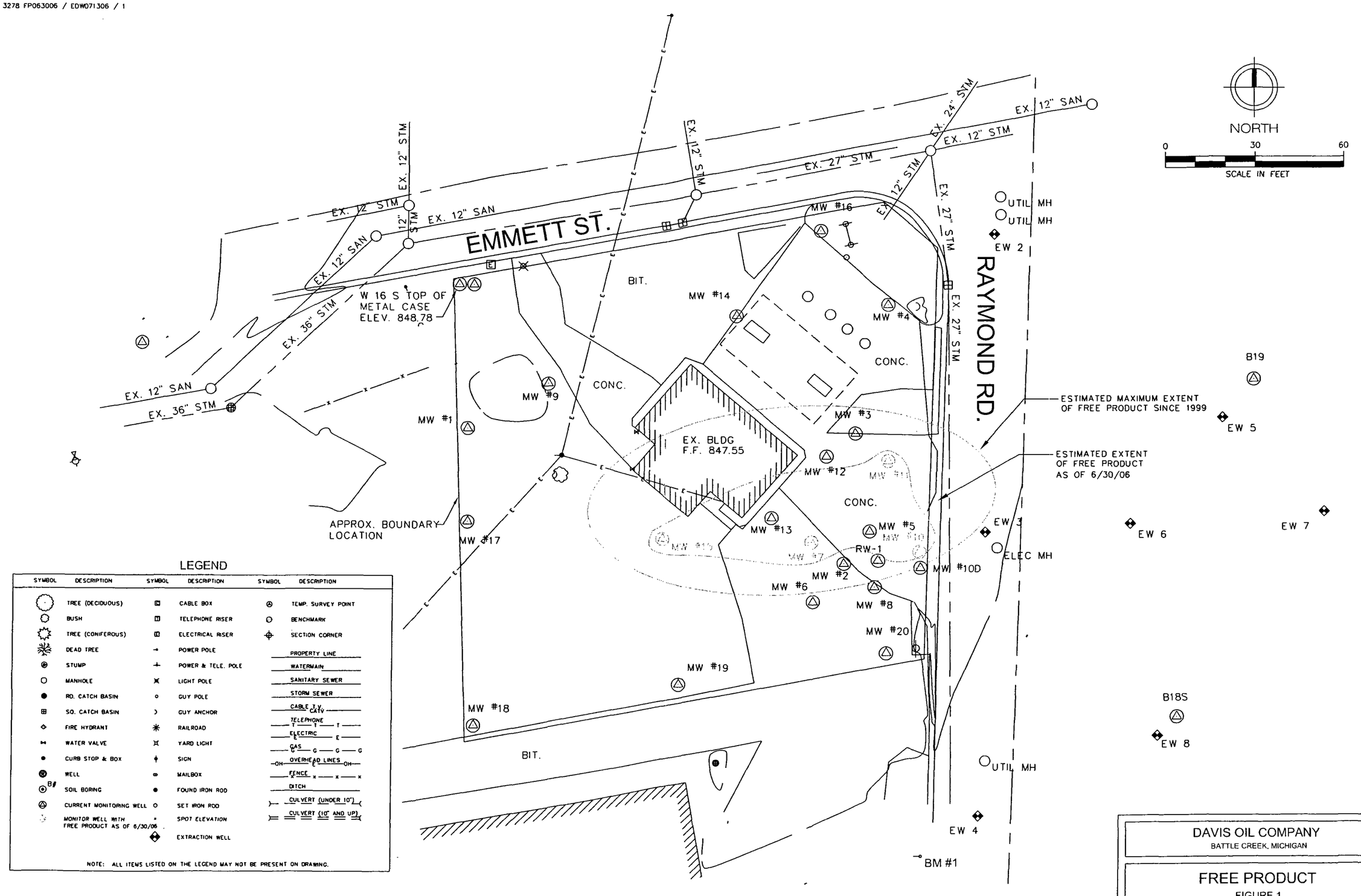


DEQ

FIVE-YEAR REVIEW ATTACHMENT 6

ATTACHMENT 7

3278 FP063006 / EDW071306 / 1



LEGEND

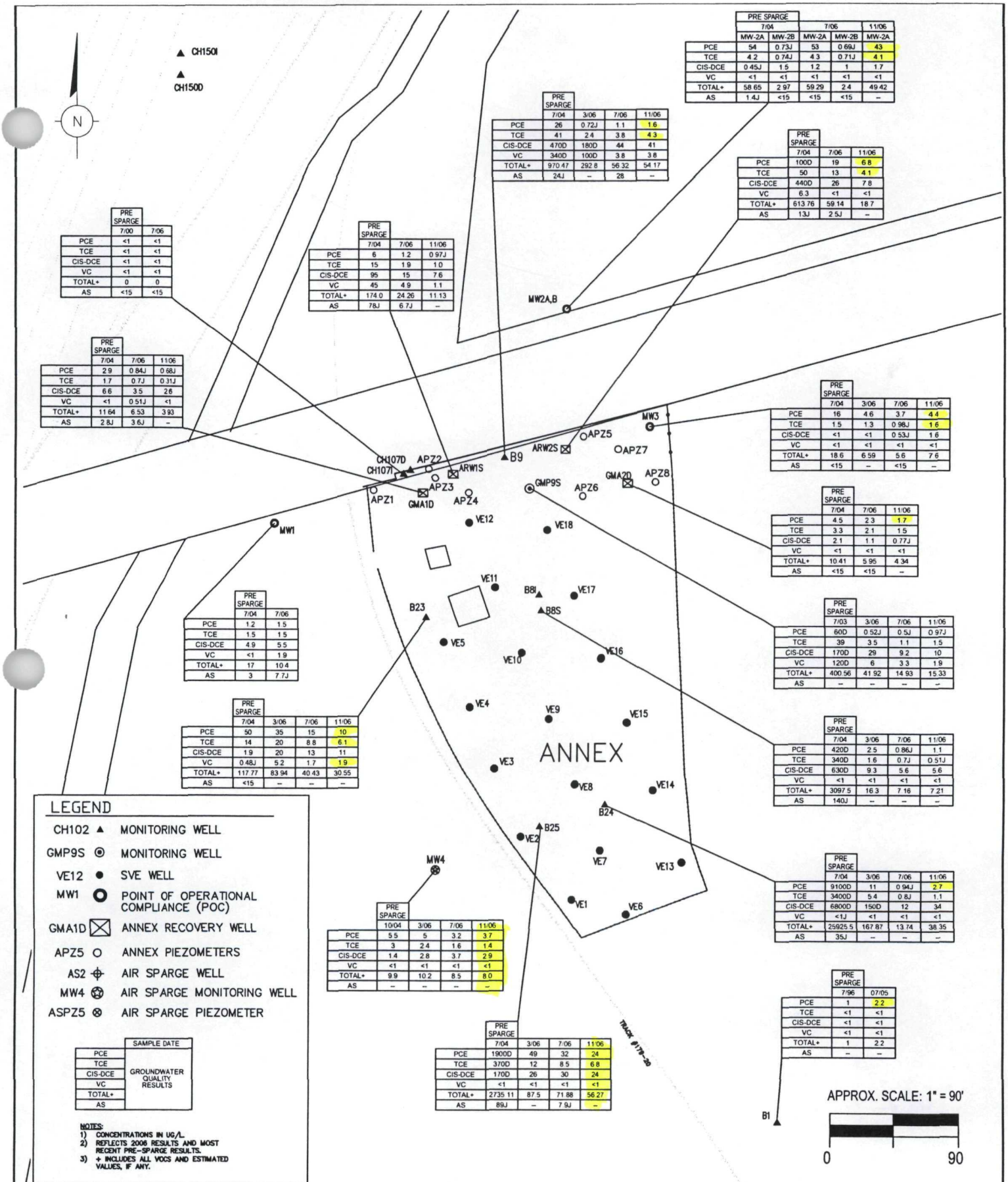
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	TREE (DECIDUOUS)		CABLE BOX		TEMP. SURVEY POINT
	BUSH		TELEPHONE RISER		BENCHMARK
	TREE (CONIFEROUS)		ELECTRICAL RISER		SECTION CORNER
	DEAD TREE		POWER POLE		PROPERTY LINE
	STUMP		POWER & TELE. POLE		WATERMAIN
	MANHOLE		LIGHT POLE		SANITARY SEWER
	RD. CATCH BASIN		GUY POLE		STORM SEWER
	SQ. CATCH BASIN		GUY ANCHOR		CABLE T.V.
	FIRE HYDRANT		RAILROAD		TELEPHONE
	WATER VALVE		YARD LIGHT		ELECTRIC
	CURB STOP & BOX		SIGN		GAS
	WELL		MAILBOX		OVERHEAD LINES
B#	SOIL BORING		FOUND IRON ROD		FENCE
	CURRENT MONITORING WELL		SET IRON ROD		DITCH
	MONITOR WELL WITH FREE PRODUCT AS OF 6/30/06		SPOT ELEVATION		CULVERT (UNDER 10")
			EXTRACTION WELL		CULVERT (10" AND UP)

NOTE: ALL ITEMS LISTED ON THE LEGEND MAY NOT BE PRESENT ON DRAWING.

DAVIS OIL COMPANY
BATTLE CREEK, MICHIGAN

FREE PRODUCT
FIGURE 1
2006 3278

FLEIS & VANDENBRINK ENGINEERING, INC.



PRE SPARGE	7/04		7/06		11/06
	MW-2A	MW-2B	MW-2A	MW-2B	MW-2A
PCE	54	0.73J	53	0.69J	43
TCE	4.2	0.74J	4.3	0.71J	4.1
CIS-DCE	0.45J	1.5	1.2	1	1.7
VC	<1	<1	<1	<1	<1
TOTAL+	58.65	2.97	59.29	2.4	49.42
AS	1.4J	<15	<15	<15	--

PRE SPARGE	7/04	3/06	7/06	11/06
PCE	26	0.72J	1.1	1.6
TCE	41	2.4	3.8	4.3
CIS-DCE	470D	180D	44	41
VC	340D	100D	3.8	3.8
TOTAL+	970.47	292.8	56.32	54.17
AS	24J	--	28	--

PRE SPARGE	7/04	7/06	11/06
PCE	100D	19	6.8
TCE	50	13	4.1
CIS-DCE	440D	26	7.8
VC	6.3	<1	<1
TOTAL+	613.76	59.14	18.7
AS	13J	2.5J	--

PRE SPARGE	7/00	7/06
PCE	<1	<1
TCE	<1	<1
CIS-DCE	<1	<1
VC	<1	<1
TOTAL+	0	0
AS	<15	<15

PRE SPARGE	7/04	7/06	11/06
PCE	6	1.2	0.97J
TCE	15	1.9	1.0
CIS-DCE	95	15	7.6
VC	45	4.9	1.1
TOTAL+	174.0	24.26	11.13
AS	78J	6.7J	--

PRE SPARGE	7/04	7/06	11/06
PCE	2.9	0.84J	0.68J
TCE	1.7	0.7J	0.31J
CIS-DCE	6.6	3.5	2.6
VC	<1	0.51J	<1
TOTAL+	11.64	6.53	3.93
AS	2.8J	3.6J	--

PRE SPARGE	7/04	3/06	7/06	11/06
PCE	16	4.6	3.7	4.4
TCE	1.5	1.3	0.98J	1.6
CIS-DCE	<1	<1	0.53J	1.6
VC	<1	<1	<1	<1
TOTAL+	18.6	6.59	5.6	7.6
AS	<15	--	<15	--

PRE SPARGE	7/04	7/06	11/06
PCE	4.5	2.3	1.7
TCE	3.3	2.1	1.5
CIS-DCE	2.1	1.1	0.77J
VC	<1	<1	<1
TOTAL+	10.41	5.95	4.34
AS	<15	<15	--

PRE SPARGE	7/04	7/06
PCE	1.2	1.5
TCE	1.5	1.5
CIS-DCE	4.9	5.5
VC	<1	1.9
TOTAL+	17	10.4
AS	3	7.7J

PRE SPARGE	7/03	3/06	7/06	11/06
PCE	60D	0.52J	0.5J	0.97J
TCE	39	3.5	1.1	1.5
CIS-DCE	170D	29	9.2	10
VC	120D	6	3.3	1.9
TOTAL+	400.56	41.92	14.93	15.33
AS	--	--	--	--

PRE SPARGE	7/04	3/06	7/06	11/06
PCE	50	35	15	10
TCE	14	20	8.8	6.1
CIS-DCE	1.9	20	13	11
VC	0.48J	5.2	1.7	1.9
TOTAL+	117.77	83.94	40.43	30.55
AS	<15	--	--	--

PRE SPARGE	7/04	3/06	7/06	11/06
PCE	420D	2.5	0.86J	1.1
TCE	340D	1.6	0.7J	0.51J
CIS-DCE	630D	9.3	5.6	5.6
VC	<1	<1	<1	<1
TOTAL+	3097.5	16.3	7.16	7.21
AS	140J	--	--	--

PRE SPARGE	10/04	3/06	7/06	11/06
PCE	5.5	5	3.2	3.7
TCE	3	2.4	1.6	1.4
CIS-DCE	1.4	2.8	3.7	2.9
VC	<1	<1	<1	<1
TOTAL+	9.9	10.2	8.5	8.0
AS	--	--	--	--

PRE SPARGE	7/04	3/06	7/06	11/06
PCE	9100D	11	0.94J	2.7
TCE	3400D	5.4	0.8J	1.1
CIS-DCE	6800D	150D	12	34
VC	<1J	<1	<1	<1
TOTAL+	25925.5	167.87	13.74	38.35
AS	35J	--	--	--

PRE SPARGE	7/04	3/06	7/06	11/06
PCE	1900D	49	32	24
TCE	370D	12	8.5	6.8
CIS-DCE	170D	26	30	24
VC	<1	<1	<1	<1
TOTAL+	2735.11	87.5	71.88	56.27
AS	89J	--	7.9J	--

PRE SPARGE	7/96	07/05
PCE	1	2.2
TCE	<1	<1
CIS-DCE	<1	<1
VC	<1	<1
TOTAL+	1	2.2
AS	--	--

LEGEND

- CH102 ▲ MONITORING WELL
- GMP9S ⊙ MONITORING WELL
- VE12 ● SVE WELL
- MW1 O POINT OF OPERATIONAL COMPLIANCE (POC)
- GMA1D ⊠ ANNEX RECOVERY WELL
- APZ5 ○ ANNEX PIEZOMETERS
- AS2 ⊕ AIR SPARGE WELL
- MW4 ⊛ AIR SPARGE MONITORING WELL
- ASPZ5 ⊗ AIR SPARGE PIEZOMETER

	SAMPLE DATE
PCE	GROUNDWATER QUALITY RESULTS
TCE	
CIS-DCE	
VC	
TOTAL+	
AS	

NOTES:
1) CONCENTRATIONS IN UG/L.
2) REFLECTS 2006 RESULTS AND MOST RECENT PRE-SPARGE RESULTS.
3) + INCLUDES ALL VOCS AND ESTIMATED VALUES, IF ANY.

APPROX. SCALE: 1" = 90'

0 90

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3912 W. Humphrey Street Tampa, Florida 33614
E-mail: info@progressiveec.com
Web Site: http://www.progressiveec.com

NO.	REVISION DETAILS	DATE

SUMMARY OF GW QUALITY ANNEX SOURCE AREA

VERONA WELL FIELD
BATTLE CREEK, MICHIGAN

DATE: 1/31/07
DRAWN: MPG
APPROVED: BSM

FIGURE: 7
SHEET 7 OF 15

FILE PATH: PROJECTS\VERONA\Drawings\2006\Annex GW Qual.dwg
SCALE: 1" = 90'

ATTACHMENT 9

- ban junk-food ads during shows geared toward young children;
- limit commercial advertising to no more than six minutes per hour, a decrease of 50 percent;
- restrict alcohol ads to showing only the product, not cartoon characters or attractive young women;
- prohibit interactive advertising to children on digital TV.

The academy also says TV ads for erectile dysfunction drugs should be shown only after 10 p.m.

Jeff Becker, president of the Beer Institute, an industry group for breweries, said parents have more influence than advertising on teens' decisions to drink. He also said brewers work to ensure that beer ads appear in adult-oriented media. For much of the sports programming where beer ads appear, most viewers are at least 21, Becker said.

"The American Academy of Pediatrics is wrong to blame alcohol advertising for the actions of underage teens who willingly break the law to drink illegally," he said.

Critics of advertising restrictions say it's a free-speech issue. But the academy notes that several Western countries, including Sweden, Norway, Denmark, Belgium and Greece, limit ads directed at children.

"What kind of society exploits its children and teenagers for money? This is an example of where public health really has to trump capitalism," said Dr. Victor Strasburger, lead author of the policy statement and an adolescent medicine specialist at the University of New Mexico in Albuquerque.

U.S. Environmental Protection Agency
Region 5
Is Starting a Five-year Review of the
Verona Well Field Superfund Site
Battle Creek, Michigan

Since 1984, EPA has been operating a system of ground-water pumping wells to prevent contamination from entering the City of Battle Creek water supply and has been working on cleanup of soil and ground water where spillage of contaminants occurred. Although progress is being made, the cleanup of soil and ground water is not complete. It is EPA's policy to conduct reviews at least every five years at sites where cleanup is not complete. These five-year-reviews ensure that the cleanup protects people and the environment.
The review includes a summary of:

$ site information
$ site inspection
$ how the cleanup was done
$ how well the cleanup is working
$ possible future actions

In 2003, EPA revised its cleanup plan to update objectives including:

$ cleanup requirements for ground water and soil
$ a list of contaminants and potential contaminants of concern affecting ground water and soil
$ measures to prevent the potential for release of contaminated ground water from a treatment system pipeline

The report *2003 Explanation of Significant Differences* may be reviewed at:
Willard Public Library
7 Van Buren St. W.
Battle Creek

For more information:

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weekdays 10 a.m. –5:30 p.m.